FLIGHT and The AIRCRAFT ENGINEER

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Editor
C. M. POULSEN

Managing Editor
G. GEOFFREY SMITH, M.B.E.

Chief Photographer
JOHN YOXALL

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The Outlook

The British Air Offensive

THE Americans, among others, have been greatly impressed by the offensive campaign which the R.A.F. has undertaken since the weather has made regular flying possible. It is hard to say which is the more impressive, the mighty day sweeps over northern France by Fighter Command, or the long journeys taken each night by Bomber Command. By day there have been from four to six separate sweeps a day, with hundreds of fighter aircraft taking part in each. According to the bulletins, most of the work has been done by Spitfires, and this is natural, for large numbers of Hurricanes have been sent overseas to Russia, the Middle East and to the Far East. The organising of a large sweep must be difficult and intricate work, as it means providing squadrons in layers at different heights, and the staff of Fighter Command deserves all credit for its skill. Sometimes the lowest stratum is composed of Hurricane bombers or Bostons, while at other times the Spitfires shoot up ground targets with their cannon.

The Germans have no real objection to seeing British fighters flying over occupied territory, galling to their pride though the sight may be. What they chiefly want to avoid just now is using up their aircraft, and they would prefer to keep them on the ground. But they cannot refuse to fight in defence of the ground targets, or to risk having their machines shot up on their airfields, and so they have to take off. When in the air they sometimes avoid battle, probably because they have been ordered to avoid losses so far as possible. Sometimes they find a British formation smaller than their own, and then they attack it, and sometimes score victories. But the fact remains that now we can afford losses better than the Germans can.

The night work likewise shows the difference in policy between the two Powers. Whenever the weather is suitable (and a fine night in England does not always mean suitable weather over a distant target) our heavy bombers set out. Fate ruled that during the long nights of winter there were comparatively few occasions when our aircraft could undertake long trips. Now, though the hours of darkness are shorter, and though lately the moon has made them even less dark, our heavies have ranged from the Baltic to Wurtemburg and Bohemia. The higher speed of the new four-engined bombers has enabled them to do more in a shorter time—but every week now diminishes the possibilities of long raids.

The German reply still further emphasises the point made above, that their present policy is to lose as few aircraft as may be. Consequently, they have chosen cathedral cities near the coast of England so as to expose their bombers to as little risk as possible. The proportion they have lost out of the small numbers sent must have been a bitter disappointment.

Madagascar

AS a naval and air base Madagascar would, if in the hands of the enemy, threaten to cut the British lines of communication from the Cape to the Middle East, to India and Ceylon, and to Australia. So much is clear from the double-page map of the Indian Ocean in this issue, which shows clearly the importance of the French island of Madagascar in the latest phase of the war.

If the Government of France had fulfilled the promise of M. Reynaud when he was Premier, and had continued

to resist the Germans in the Colonial Empire after its military defeat in France, the arrival of British forces at the island would have been welcomed. But the Vichy Government is hostile to every patriotic instinct of the French people—and they are as patriotic as any people in the world. It was Vichy's surrender of Indo-China to the Japanese which has led to the fall of Singapore and to all the trouble which the United Nations now have to face in the Far East. When Vichy proclaims that French possessions will be defended, we have to supply the unspoken words "against our former Allies, but not against our conquerors and oppressors." Therefore, it became an obvious necessity for us to forestall the Japanese at Madagascar, whose garrison could not have repelled a Japanese invasion even if it had had the will. Our action has been virtually a repetition of the affair in Syria. We may congratulate ourselves that we have a Prime Minister who does not hesitate to take strong action in good time. We all lament the necessity of attacking Frenchmen, we grieve that nearly 500 British fighting men have fallen to the fire of the French, and that our men have had to shed French blood.

The resistance of the garrison was hopeless from the first, and we can only conclude that Laval, the most perfidious enemy of Britain and France alike, ordered it with the express desire to promote bad feeling between the two nations and to curry favour with his German masters. It must have been obvious from the first that the British force was in overwhelming strength, and that there would have been no dishonour to the French in submitting to it at once.

In time we may be told which of our carriers accompanied Admiral Syfret's fleet. The action was another example of the value of carriers when properly used. The French aircraft on the island were few, and in all probability not very efficient. We must have had complete air superiority, and that counts for a lot. It is not possible to believe the French story that we dropped parachutists from aircraft, for Whitleys are not carrier machines, and smaller types could not drop enough men to be of any material use. Mauritius is only 510 miles away, but it would have been a lengthy business to have established a Whitley base there, and such an idea may be dismissed.

It has been a distasteful business, but it has been well carried out, and a very grave danger to our cause has been averted.

Asymmetrical Aircraft

LAST week the daily Press got all excited about an announcement made by the German radio concerning a new "asymmetrical" aircraft for which rather extravagant claims were made. Readers of *Flight*, at any rate, will not have been taken by surprise, for as long ago as our issue of August 7th, 1941, we published four drawings of this type of machine, patented by the Hamburger Flugzeugbau and its chief designer, Richard Vogt.

Our first reference to asymmetrical aircraft was made in a leading article on July 3rd, 1941, in which we examined a suggestion for such a type made by a Royal Air Force officer. The German aircraft which has now caused all the excitement is not new. One of our readers wrote to us in August of last year and told how, on a flying visit to Germany a few weeks before the outbreak of war, he had seen the machine at Hamburg. His recollection was that the engine, a radial, was on the port wing, while the pilot occupied a central nacelle.

While the Hamburger Flugzeugbau can probably claim to be the first to get an asymmetrical aircraft into the air, they were not the first to patent such a design, for Mr. Theodore P. Wright, technical chief of the American Curtiss-Wright concern, sent us a patent specification which we published in our issue of February 5th of this year. Mr. Wright's patent was applied for in 1929 and granted in 1933, whereas the German patent was not applied for until 1937.

The suggestion of the R.A.F. officer was for an asymmetrical twin-engined aircraft, which appears to offer greater advantages than a single-engined type because drag is saved, whereas with one engine drag is added and only forward view is improved.

WAR BIRD OF PREY: The Warhawk which is the latest single-seater out of the Curtiss nest, in direct succession to the Mohawk, Tomahawk and Kittyhawk fighters. It is fitted with the 1,280 h.p. Rolls-Royce Merlin engine built by the Packard Company in the U.S.A. *Some details of the Warhawk and Packard Merlin appear on page 474.*

COASTAL CONVOY DEPART : At early dawn a convoy of merchantmen raise steam and prepare to sail. During the journey they will be protected by escort ships, towed barrage balloons and R.A.F. fighter patrols.

War in the Air

Respite at Malta : U.S. Naval Victory : R.A.F. Offensive Continued

THE attacks on Malta have been diminishing in severity in the last two or three weeks, though the number of alerts has been no less. Alerts are a nuisance, but they do less harm than bombs. The important point is that since the last week in April the number of German bombers which have flown over the island has been reduced by something like four-fifths. It is interesting to speculate on the reason for this, but most observers will probably conclude that the *Luftwaffe* is massing for the spring offensive in Russia. The Malta defences have very materially reduced the number of German bombers and fighters available for the coming conflict. The factories will probably replace the machines, but the crews lost are not so easy to replace.

It must have gone to the heart of the German High Command to risk and lose so many machines and crews over Malta, for it is obvious from the *Luftwaffe's* behaviour in the Franco-British area that there is a great desire to conserve both men and machines.

ATLANTIC BATTLE BOWLERS : Anti-aircraft gunners of the U.S. Navy wearing the new bowl-style steel helmets which cover the nape of the neck and both ears.

GIVING THEM THE LOW-DOWN : Crews of a squadron of Hurricane II bombers being interrogated on their return from scoring direct hits on two German destroyers off Brittany.

This has been shown by the series of attacks on our cathedral cities, all of which have been near the coast. That has meant that the raiders have not run the risks of long flights inland, for such penetration gives better chances to the warning system and to all the defence organisation ; and also means that damaged aircraft have less chance of regaining their bases. The cathedral cities are small, concentrated targets, as compared with huge places such as London and Birmingham, and a comparatively small number of bombers can do proportionately higher damage. But the Germans must have been disagreeably surprised by the numbers of bombers which they have lost on such minor enterprises. British night fighters are now much more formidable than they were in the autumn of 1940, and of late they have been helped by bright moonlight.

R.A.F. Offensive

WHILE the war has been almost at a standstill in Russia and Libya, the great R.A.F. offensive has been carried on by day and by night with unabated energy. The Germans never know where next the Stirlings, Halifaxes and Lancasters will strike. They devote one week to the Baltic ports, and the next week they range down to Stuttgart, the capital of the former kingdom of Wurtemburg (of which Count Zeppelin was a native), and to the Skoda factory near Pilsen, in Bohemia. Though the Heinkel works at Rostock suffered heavily, it may be noticed that Bomber Command is paying less attention to aircraft factories than to targets which will retard the German output of supplies for their campaign in Russia and for the Battle of the Atlantic. The fact is that the *Luftwaffe* is no longer supreme on any important front, and Bomber Command does more good to the Allied cause by interfering with the production of such things as tanks and submarines. That the Germans are alarmed by the recent operations of our night bombers is proved by the way in which their propaganda agencies, including Lord Haw-Haw and the wireless station which pretends to be British, have been emphasising how useless the British night raids have been. These agencies have been advising the British Government to concentrate, not on heavy bombers, but on aircraft to assist the Army. Well, we hope this will be done, while the other is not left undone.

The daylight work of Fighter Command has been most spectacular. During the fine weather, day after day, huge numbers of fighters have swarmed over France, sometimes making up to six sweeps in a day. The Germans do not want to fight in strength in France ; they would much prefer to keep their fighters safe for other objects, but the British offensive has forced them into the air. When fighting takes place at great heights the victories of our men cannot always be confirmed, nor can we always tell when a British pilot who jumps from his damaged machine gets safely to earth and is made a prisoner of war. So the official reports sometimes show our losses in fighters as greater than those of the enemy. But such reports do not always give a true picture of what has actually happened, and it is significant to note that often our Spitfire pilots come back and report that the enemy was reluctant to engage. That in all probability gives the true key to German policy.

U.S. Naval Victory

THOUGH the island of Corregidor has fallen, and its heroic defenders are now in the hands of the barbarous Japanese ; though the latter have pushed armoured forces up the Burma Road to the frontier of Yunnan ; though it is reported that they have occupied Akyab (the most northerly port of Burma), and even that they have crossed the frontier into Bengal, still the American naval victory near the Solomon Islands is at the moment of writing the most important, as well as the most cheering, news from the Far East Front. That aircraft took part in the battle is shown by the announcement that the only American losses were three aircraft. In fact, it now goes without saying that there can hardly be a naval action without aircraft—at least on one side. Once the United States Navy is able to exert its

PREOCCUPATION : Ground staff of a fighter squadron so intent on the job of re-arming and refuelling their Spitfire that they fail to notice His Majesty the King passing by. On the right is Air Marshal Sir W. Sholto Douglas, A.O.C.-in-C. Fighter Command.

WAR IN THE AIR

ENEMY AIR LOSSES TO MAY 9th.

		Over G.B.	Over Continent	Middle East
May	3	5	8	3
"	4	4	10	3
"	5	0	4	0
"	6	0	2	2
"	7	3	0	0
"	8	2	1	0
"	9	2	1	7
		16	26	15

Totals: North 5,878; Middle East, over 3,753.

true power in the Pacific, the Japanese will have lost their gamble. Admittedly this was only a cruiser action, and a decision must depend on the battleships, but it shows that the Americans are beginning to recover from the shock of Pearl Harbour. Complete recovery can only be a matter of time. Australian forces also took part in the battle.

In the meantime, this American victory and the destruction of some Japanese warships and the damage to others must materially ease the threat to Australia. The R.A.A.F. has done wonders in holding the Japanese off by bombing them in the New Guinea area, but this destruction of Japanese ships will be a great help in their task. Incidentally, the Viceroy of India has stated that the Japanese fleet has withdrawn from the Bay of Bengal. Perhaps the air raid on Tokyo had something to do with that.

Later News

ABOUT the British occupation of Madagascar nothing need be said here except that a carrier obviously accompanied our fleet, and gave us air superiority. More air interest attaches to the convoy battle in the Arctic in which H.M.S. *Edinburgh* was lost. It was another case in which air torpedoes proved more deadly than air bombs, this time to the advantage of the Germans. None the less, dive bombers have several times shown themselves to be effective weapons for attacking ships, as H.M.S. *Illustrious* can testify. In the later accounts so far to hand of the battle in the Coral Sea, which are still very scrappy at the moment of writing, American dive bombers are reported to have sunk several of the Japanese vessels. In fact, aircraft seem to have played a larger part in the action than the fire of the ships; but one cannot draw conclusions until full reports are made public.

COMING IN TO LAND: This photograph of S.B.3 with wheels and flaps down gives an excellent idea of the layout of one of Russia's best medium bombers. It is a mid-wing cantilever monoplane with two 1,100 h.p. M.100 liquid-cooled engines. Span 70ft. 6in., length 40ft. A crew of three is carried and the maximum speed is in the region of 280 m.p.h.

There are also confused accounts of the development of the Battle of Burma. The Chinese claim that the Japanese force which pushed forward so impetuously up the Burma Road to Yunnan has been badly defeated, while the American Volunteer Group has been bombing the enemy along the road. The Chinese armies in Burma are also said to have recaptured Maymyo and to have cut that Japanese force off from its base. Another force of Chinese is said to have recaptured Mandalay and to threaten the rear of the Japanese column which had advanced towards the Salween river. Blenheims have raided an airfield occupied by the Japanese, while the heavy American bombers based in India make periodical attacks on the port of Rangoon, to interfere with the enemy's seaborne communications and reinforcements. On the other side of the picture, Japanese bombers have raided the port of Chittagong, in India, and refugee camps on the way from Burma to Bengal.

A Dornier 217, raiding Britain on the night of May 8th, ran into a mobile balloon squadron, hit a cable and crashed in flames.

"ХОРОШІЕ" BOMBS: The Russian equivalent of Lord Beaverbrook's beauties being put into the racks on a snow-covered airfield.

BRITISH AIR LOSSES TO MAY 9th.

		Over G.B. A'crft.	Over Continent B'brs.	Over Continent Ftrs	Middle East A'crft.
May	3	0	0	0	1
"	4	0	5	7	2
"	5	0	4	6	0
"	6	0	7	1	2
"	7	0	2	0	0
"	8	0	19	0	0
"	9	0	0	7	7
		0	37	21	12

Totals: North, 3,703; Middle East, about 1,113.

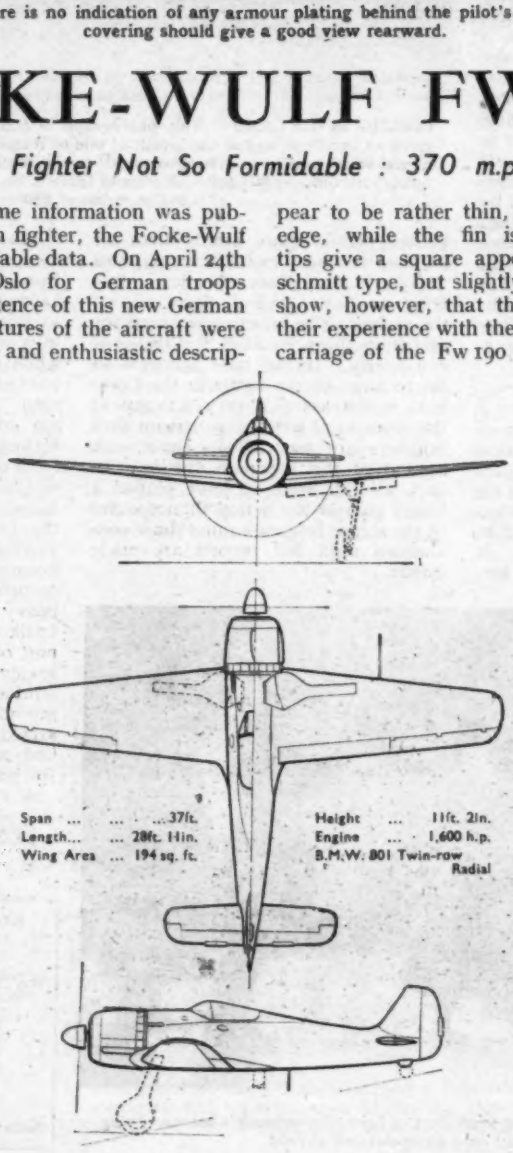
THE Fw 190 IN FLIGHT: There is no indication of any armour plating behind the pilot's head, but the transparent cockpit-covering should give a good view rearward.

FOCKE-WULF FW 190

Germany's Latest Fighter Not So Formidable : 370 m.p.h. on 1,600 h.p.

IN *Flight* of March 26th some information was published about a new German fighter, the Focke-Wulf Fw 190, based on then available data. On April 24th a German broadcast from Oslo for German troops in Norway announced the existence of this new German fighter. On the same day pictures of the aircraft were released in Berlin, and a vague and enthusiastic description published for home consumption. Reports indicate that the aircraft was used for some months in various theatres of war with what the Germans call "brilliant successes." In fact, numbers of this type have been shot down by the R.A.F., and pilots who have encountered them do not consider the fighter quite so remarkable.

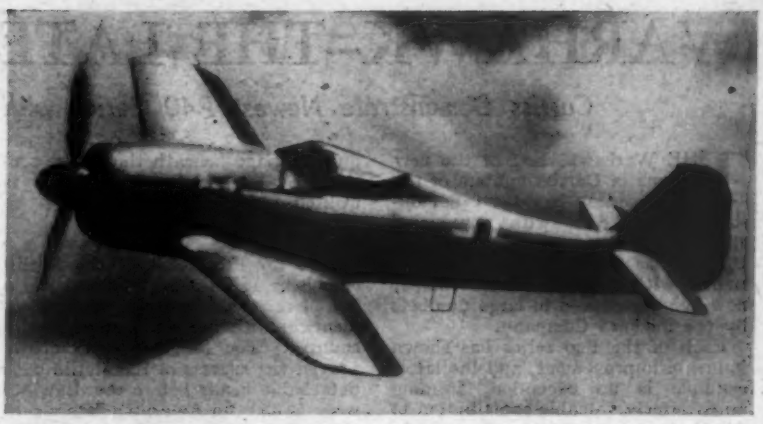
The Fw 190 was designed by the "Armament Industry Leader" (Wehrwirtschaftsfuehrer) Kurt Tank, the creator of the Focke-Wulf Fw Condor, and the short-range reconnaissance aircraft Fw 189. The new fighter has a span of approximately 37ft., length 28ft. 11in., and a wing area of 194 sq. ft. It is powered with a B.M.W. 801 14-cylinder two-row air-cooled radial of 1,600 h.p. Its top speed is reported to be in the region of 370 m.p.h. at 18,000ft., with a range of 500 miles at a cruising speed of 300 m.p.h. There is nothing revolutionary in the design of this new *Luftwaffe* acquisition. The wings appear to be rather thin, tapered mainly on the leading edge, while the fin is of orthodox design. Wing tips give a square appearance, similar to the Messerschmitt type, but slightly more rounded. Some features show, however, that the Germans have profited from their experience with their previous fighters. The undercarriage of the Fw 190 is widely set apart, a hitherto unknown arrangement in German fighters. It is stilted, and retracts inwardly in the wings. The aircraft does not display the same "tubby" features as most radial air-cooled fighters. Although rather short, it is relatively slim, with a long cowl and a mild drop to the nose. The fuselage gives a somewhat flat appearance on the sides. The weight distribution is reported to be such as to make the aircraft quickly manœuvrable in short turns.



The cockpit is placed rather elevated, but the visibility does not seem altogether good. This is made worse by the acute angle at which the frontal cockpit screen is mounted, which increases glare and reduces the field of vision.

The designer was obviously facing the problem of producing an aerodynamically clean type fitted with a twin-row radial engine. The attempt to solve it is perhaps the most marked feature of the new fighter. For this purpose the diameter of the engine cowl-

ing was reduced to a minimum, which, although resulting in a somewhat "slimming" effect, has produced new problems in the cooling of the engine. Since the diameter of the engine cowl is reduced, and all exhaust and inlet pipes from cylinders pass to the rear of the engine, there is a great congestion between the cylinders of the B.M.W.801. For this reason, assisted cooling (baffles) had to be introduced to prevent overheating, while a multi-blade fan on the engine nose is fitted to supply additional air cooling when the engine is either idling or being tested. The fan is mounted on a hollow hub through which the airscrew shaft passes, and runs on bearings on the engine. The fan is driven by special gearing from airscrew reduction gear, while it is propelled in flight by the airstream. Oil-cooling radiators are fitted as integral sections of the front rim of the engine cowl, and are servo controlled for temperature by a mechanism at the rear of the engine. The air from slipstream passes into back of radiators and escapes in front. Radiators are designed to offer a minimum drag. Direct fuel injection is employed with a new type of pump unit. The pumps are arranged radially on a casing, inside of which rotates a large-diameter face cam; the pipes are led from the pumps in much the same manner as the high-tension leads from a distributor casing.

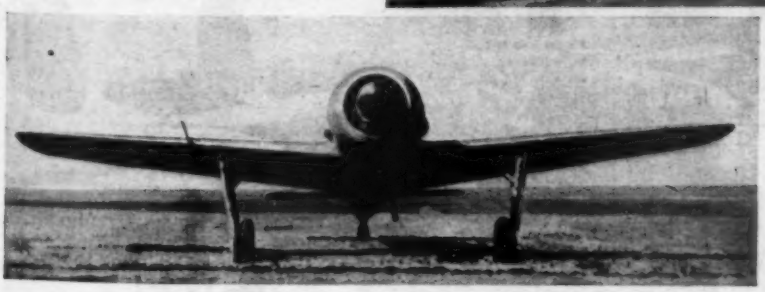


This flying view of the Fw 190 emphasises the care taken to preserve a good streamline form. The footrest is retractable but apparently has been left extended by accident.

At the rear of the engine is a box containing a compact complicated mechanism for servo controlling boost pressure, fuel injection, oil temperature, etc., and relieves the pilot of many duties in the control of the engine. Though cleverly designed, the "mechanical box" was certainly built with complete disregard for considerations of economy.

The armament of the Fw 190 is not known. German reports mention a mixed armament of machine guns and cannons, which is presumably placed in the wings. Reports from pilots who have met the new fighter indicate that in both manœuvre and armament efficiency the Spitfires are superior in combat. The described congested arrangement of the power plant makes it particularly vulnerable, since even one hit on the engine may produce serious defects in the compact mechanism.

It is possible that the Fw 190 is not Germany's last word in the production of fighters. While the machine is certainly a serviceable, commonplace type, it may be that the emergency of the situation gave it its birth rather than a planned desire. For it can be assumed that if the *Luftwaffe* had had at their disposal any in-line power plants of an output commensurate with up-to-date fighter requirements, they would have taken a different course. Instead, they had to make a virtue out of necessity, and indulge in the application of the available engine type for their new fighter—a costly process resulting in a complicated mechanism of yet unknown value.



(Above) Lined up for inspection: Note the long chord engine cowling and the almost parallel lines from the nose to the cockpit.

(Left) Front view: Something new on a German fighter is a retractable undercarriage almost twice as wide as that on the Messerschmitt 109. A wide track is necessary for use on unprepared airfields.

WARHAWK–THE LATEST FIGHTER

Curtiss Demonstrate Newest P40 Series with Merlin XX Engine

THE Warhawk, first of the new range of Curtiss fighters of the P40 series, has been demonstrated in U.S.A. with convincing effect. This latest type, designated P40.F, has a Merlin XX 27-litre engine with two-speed supercharger now being produced in large numbers by the Packard Company.

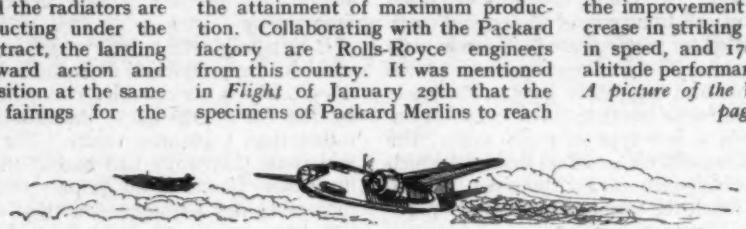
Each of the P40 series has shown immense improvement, and the latest example is no exception, forming an extremely valuable contribution to Allied fighter strength. It will be noted that it is a low-wing type with moderate dihedral, wings moderately tapered to rounded tips and generous fillets at the roots. The spinner is sharply pointed, and the radiators are embodied in the ducting under the nose. All wheels retract, the landing wheels by a rearward action and twisting to a flat position at the same time. There are fairings for the undercarriage beneath the centre section. A 3-blade Curtiss airscrew is utilised.

Packard Merlin

Save for the fact that the Merlin engine being built by Packard has a two-piece cylinder, the engine is identical with the productions in this country. The Rolls-Royce Company proved the success of the Merlin with detachable heads before the drawings were issued to America, and would themselves have put this design into production two years or more ago had it not been for the fact that to introduce such an important modification of this character would have delayed the attainment of maximum production. Collaborating with the Packard factory are Rolls-Royce engineers from this country. It was mentioned in *Flight* of January 29th that the specimens of Packard Merlins to reach this country have been highly appraised.

The Warhawk is the successor to the Tomahawk and Kittyhawk. It is faster than its forerunners (the engine has a power rating of 1,280 b.h.p.), has a higher service ceiling thanks to the improved supercharger and central entry of air provided by a modified supercharger casing. It is exceptionally powerfully armed, based upon British experience in the war. In referring to the Warhawk in *Flight* of February 5th last we quoted American reports of 400 m.p.h. speed and an estimated ceiling of 25,000ft. A Curtiss chart comparing its characteristics with the P36 Mohawk gave the improvement as 657 per cent. increase in striking power, 123 per cent. in speed, and 170 per cent. in high-altitude performance. G. S.

A picture of the Warhawk appears on page 468.



B-25s ON MANY FRONTS

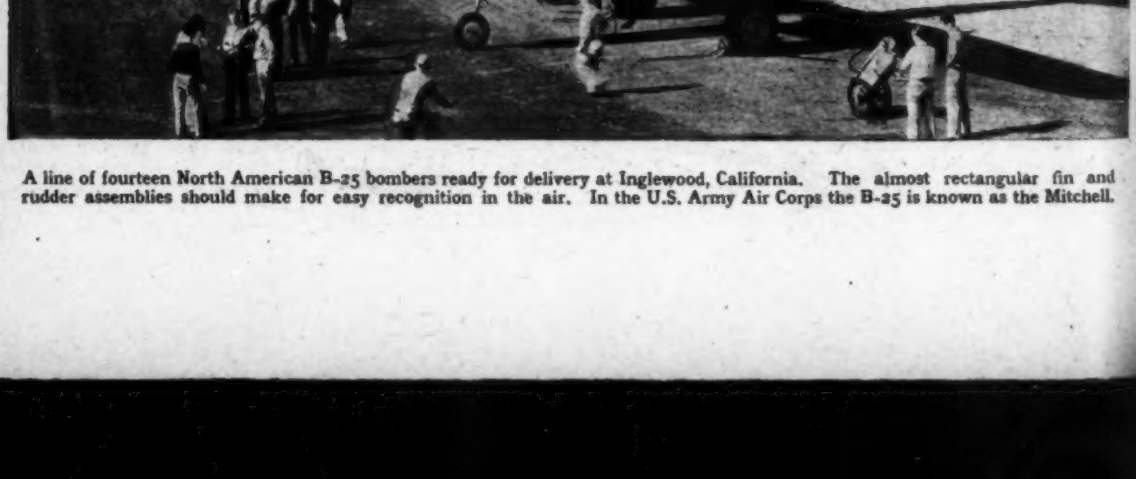
Another Tricycle Bomber Which is Being Produced in Quantity for the Democratic Powers

ALL the United Nations air forces are now receiving the North American B-25 twin-engined bomber, which is being produced both at the firm's home plant at Inglewood, California, and at the huge bomber assembly plant at Kansas, which is owned by the U.S. Government and operated for them by North American. Latest reports from Inglewood state that these fast, long-range bombers are being delivered to the U.S. Army Air Force, the R.A.F., the Netherlands East Indies Air Force, the Russian and the Chinese Air Forces.

This machine (maker's designation, NA-40A) carries a crew of five and is a medium-sized aircraft with a span of 67ft. 6in., a length of 51ft. 5in., and a wing area of 601 sq. ft. It is powered by two 1,600 h.p. Wright Cyclone engines and is fitted with hydraulically operated tricycle landing gear.

According to the March issue of the maker's own house journal, the speed and range of the B-25 are military secrets, but both *Janes* (1940) and *Aerosphere* (1941) give it a maximum speed of 308 m.p.h. and a cruising range of 2,650 miles. A gross weight of 24,000 lb. gives a wing-loading of 39.33 lb./sq. ft., and it has a disposable load of 8,000 lb. The actual bomb load is not stated, but by allowing for 916 gals. of fuel and 84 gals. of oil, an approximate idea may be gained.

It was a B-25 on Atlantic patrol which was credited with sinking the U.S. Army Air Force's first German submarine of the present war.



A line of fourteen North American B-25 bombers ready for delivery at Inglewood, California. The almost rectangular fin and rudder assemblies should make for easy recognition in the air. In the U.S. Army Air Corps the B-25 is known as the Mitchell.

HERE AND THERE

Once Bitten . . . . ?

HERE is a light-hearted gem from *The Spinner*, house organ of General Aircraft, Ltd.

H.G. threatened with Red Cross Nursing practice offers exchange demonstration with tommy-gun.—(Advt.).

Cushy Job!

VISITING an aircraft factory, a fighter pilot got in conversation with a pretty girl working hard at one of the machines.

"What did you do before the war?" he asked.

"Oh—I didn't do anything before the war. *I was only married!*" she replied.

No "Trade Secrets" Now

INDICATING the spirit of co-operation of American aircraft manufacture in the war effort, the Boeing Aircraft Company, of Seattle, builders of the Flying Fortress bombers, announced recently that it has turned over to the Consolidated Aircraft Corporation of San Diego comprehensive information on the organisation and methods of its flight and aerodynamics department to aid the California company in establishing a similar "test program."

Lonely Island's First W.A.A.F.

MARGARET was the first W.A.A.F. to stay at a Coastal Command station on a lonely and remote British island. She arrived in the R.A.F. air ambulance, one of the new women medical orderlies who fly with this aircraft, and her arrival created a stir.

The W.A.A.F. girl was an A.C.W.2, and she had come to supervise the removal to convalescence on the mainland of two men seriously wounded in the Vaagso raid. It was not intended that she should stay; but bad weather compelled the pilot to remain on the island for a little while.

Needless to say, she was heartily welcomed and royally entertained. Why, they even gave her an egg for her tea!

Going to Dublin?

WAR or no war, and despite the none too helpful attitude of our neutral neighbours in Eire, you can still fly to and fro between Manchester and Dublin if you so desire—subject to certain regulations.

The service is operated by Irish Air Lines in association with West Coast Air Services, Ltd., and their 1942 summer time-table was recently issued.

The schedule provides a crossing in each direction, morning and afternoon, and you may take your dog or your canary, but not your camera.

Aerial Soundings

IT may not sound highly scientific, but unless a certain Sgt. Pilot is pulling our leg he has a somewhat unorthodox way of correcting erring altimeters when flying over the northern seas when visibility is zero-zero.

"What we do," he said, "is to trail our aerial and come gradually down, lower and lower, until it touches the water; then we set the altimeter at zero."

One imagines that contact is recorded "in no uncertain voice."

TRUE TAIL: With more than half his rudder shot away, as shown, this Australian fighter pilot successfully engaged a Me 109 in combat, and afterwards reported that the piece left functioned perfectly.

Murder Will Out!

READERS will doubtless remember our issue of December 25th, 1941, into which we infused a seasonably Christmas touch by means of four pages of light comedy, one of which reproduced cartoons selected from German aviation journals.

Believing in fair play, even to the enemy, *Flight* acknowledged the German source of these cartoons, but we now find that at least two of them had been pilfered from earlier issues of our American contemporary, *Flying and Popular Aviation*.

The Jerry "cartoonist" even went to the length, in one instance, of substituting his own signature for that of the original American artist!

Could journalistic banditry go farther?

Yes, it could! *Flight* has had whole articles "lifted" by foreign bandits and reprinted under another author's name!

Death of Lord Amulree

LORD AMULREE, whose death on May 5th we regret to record, was a K.C. who did a lot of very useful work for the country. Of all his activities, that which will be least remembered was his brief tenure of the office of Secretary of State for Air in 1930-31.

Lord Thomson had been killed in the tragic crash of the airship R101, and the Prime Minister, Mr. Ramsay MacDonald, had to find someone to fill the post for a while. He chose Lord Amulree, largely because it would have been inconvenient at the time to select a Member of the House of Commons, and his chief task was to arrange for the reduction to scrap metal of the other airship, R100.

It is casting no slur upon his memory to say that he had but the slightest knowledge of matters aeronautical, and, in his brief tenure of the office of Air Minister, had little opportunity to learn much about the subject. It was, in fact, outside the circle of work in which he made for himself a very honourable name.

DOGS OF WAR: Alsatians, loaned to the Government for the duration of the war, are now being trained for guard duties at airfields, factories and other important places in this country. For this purpose, volunteer dog-lovers in the Services stay with the animals after training them, and here are some exercising on an airfield.

D

Ahead of Their Time—4

MODERNITY IN 1911

An Antoinette Monoplane with Cantilever Wings, "Trousered" Undercarriage, and Engine with Steam Cooling and Direct Fuel Injection

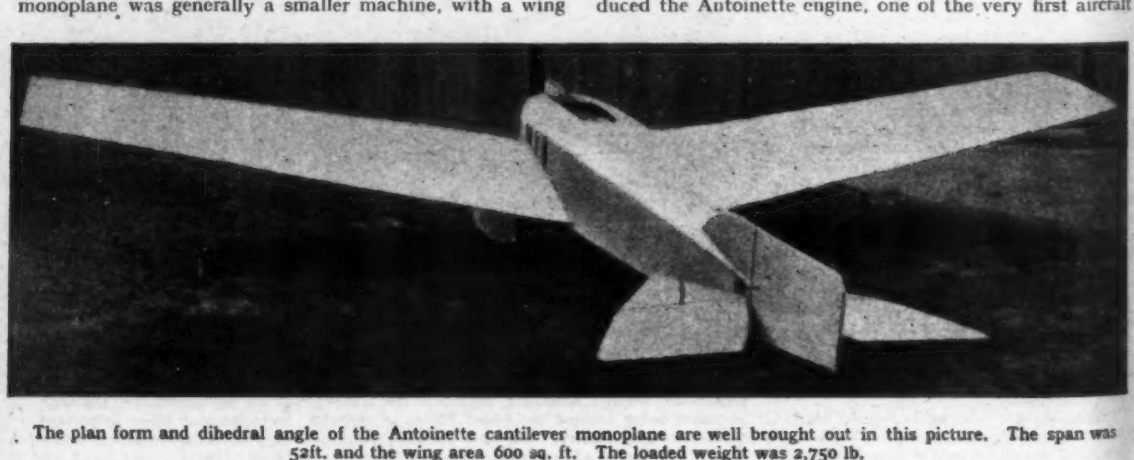
By THE EDITOR

The Antoinette monoplane of 1911 had a "trousered" undercarriage. Each leg contained two main wheels and a small nose wheel, the latter to prevent nosing over.

A PROPER appreciation of the subject of this week's reminiscence of an early aircraft type which was ahead of its time can only be obtained by recalling briefly the contemporary types in the different countries. The year with which we are concerned is 1911. France was, at that time, well ahead of Great Britain in aviation development, and probably Germany came second to France. In Germany the "fashionable" type was the "Taube" (dove), of which the main exponents were the German designers Ettrich and Rumpler. In this country the "opposite number" to these two was Mr. Handley Page, whose monoplanes resembled the tauben slightly, but only slightly. The German monoplanes had fairly straight wings, with the tips only swept back and up for stability. Handley Page adopted a crescent-shaped wing plan form with up-turned wing tips. In both cases the object was the same: lateral stability. Handley Page used orthodox wire bracing, while the Germans were fond of employing a spanwise boom below the wing, so that the girder was virtually a biplane truss, and had all the drag of the biplane but without the corresponding advantage of the lift of the lower wing (the boom was merely streamlined and non-lifting). These designers were more concerned with what we used to term inherent stability than with performance.

In France at the time opinion was fairly evenly divided between monoplane and biplane protagonists. The biplane was nearly always a pusher with open tail booms. The monoplane was generally a smaller machine, with a wing of fairly short span, wire braced to pylons above and below the fuselage. Examples were the Bleriots and the Deperdussins. A French variant was the Antoinette monoplane, which had a shallow fuselage of triangular section, much larger wings than those of the Bleriots and Deperdussins, and a fairly elaborate form of wing bracing, which made ue of king posts on the wings. Generally speaking, the biplanes were used for load carrying and the monoplanes for speed. Few French designers worried very much about stability.

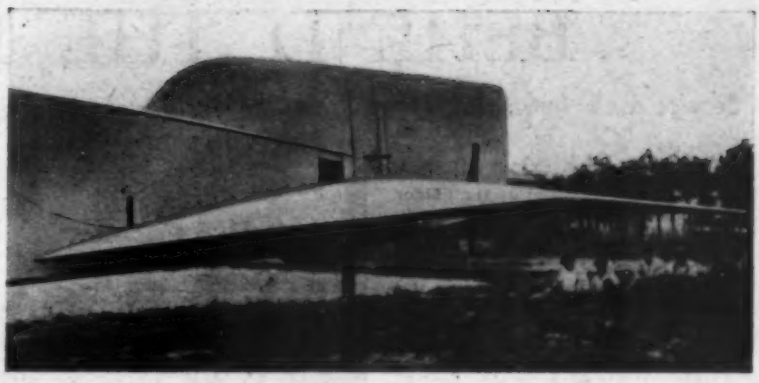
Then came the French army competition, and the Antoinette firm decided that their normal type would not stand a chance. A completely new model was produced by M. Levavasseur, and it is this machine with which I propose to deal this week. Levavasseur was, I believe, originally a boat designer. Some years previously he had joined forces with the Gastambides, and the firm had produced the Antoinette engine, one of the very first aircraft



The plan form and dihedral angle of the Antoinette cantilever monoplane are well brought out in this picture. The span was 52ft. and the wing area 600 sq. ft. The loaded weight was 2,750 lb.

engines, and the Antoinette monoplanes. Some time during 1909 Levavasseur had a disagreement with the managing director and left in a huff. Early in 1910, however, he came back, the firm was reorganised, and work was begun on more powerful engines and on the Antoinette monoplane designed for the French Army competition.

Two features of this machine leap to the eye in the photographs of the machine: the wings were without external bracing and the undercarriage was of the type which, a great many years later, we came to call the "trousered" type. In those days it was always argued, by the majority of British designers at any rate, that the thick cantilever wing offered as great a drag as the externally braced thin wing, and that, in addition, the cantilever wing was necessarily much heavier per square foot of wing area. As the flange stresses increase at the rate of something like the fourth power of the spar depth, that was a logical argument, and at the speeds obtainable with the low engine powers available in those days, the argument about drag was probably also justified. At that time we had not "discovered" interference drag and suchlike; we merely took the drag of individual items and added them together.



The rudder, of aspect ratio less than 1, cannot have been very efficient, and the machine was probably unstable directionally.

Early Streamlining

Levavasseur must have had an inkling that two plus two did not necessarily make four so far as drag was concerned. He set to work to streamline his new monoplane (although the term was unknown then), and there is little doubt that he succeeded, although I have no figures to prove my belief. He made his wings pure cantilevers, and I believe that he used a multi-spar type of construction.

Undercarriages were great drag producers in those days. Usually there were skids as well as wheels, sometimes a single skid and sometimes (more often) two skids side by side. Levavasseur made his undercarriage as well as his wing cantilever, and enclosed it in "trousers." Not only so, but to assist in preventing the machine from nosing over, always a preoccupation of early designers, he placed a small wheel in the front corner of each trouser leg. The trousered undercarriage was revived by German glider designers after the war 1914-18, and was then commonly thought to be original.

For the French Army competition a new and more powerful (100 h.p.) Antoinette engine was designed. Perhaps it would be more correct to say that it was evolved from the old type, since the main change was in the number of cylinders. The early engine was an eight-cylinder vee, whereas the new was a twelve.

Even in the engine M. Levavasseur was original. He carried but a small quantity of cooling water, and allowed it to evaporate in the cylinder jackets. The steam was then condensed in large coolers lying flat against the sides of the fuselage. The engine had two valves per cylinder, a mechanically operated exhaust valve and an automatic inlet valve. There was no carburettor; instead two fuel pumps delivered petrol to the inlet valve chambers. The stroke of the pumps was varied by an eccentric. Ignition was by battery and coil.

Flight recorded, on September 30th, 1911, that the Antoinette cantilever monoplane had flown, but it did not enter the competition, and in fact it never figured in our columns again. Perhaps the reason is not hard to guess. Lateral control was invariably by warping the wings of monoplanes; ailerons were introduced by Farman on biplanes, and did not come into general use for monoplanes for a good many years. It seems obvious that the cantilever wings of the Antoinette could not be warped, and I do not think it had ailerons, so one is forced to the conclusion that it was a two-control monoplane, and that the dihedral angle was relied upon for lateral stability.

The picture of the machine shows a small fin and rudder, and in view of the large fin area of the "trousers," one would expect a very large tail fin and rudder to be necessary. This points to the machine being directionally unstable, and this would in itself be sufficient to account for the complete disappearance of the type. I feel that it probably suffered from what Dr. F. W. Lanchester, in the early days, called "catastrophic instability."

C. M. P.

NURSES' GIFT TO R.A.F.

Second Fund Buys Two Spitfires

ON Tuesday, May 12th, the anniversary of the birth of Florence Nightingale, the nurses of Great Britain formally presented to the country a cheque for £10,000 to purchase two more night-fighters "to defend the hospitals of Britain." They are to be Spitfires.

One of these night-fighters is to replace *Nightingale*, the original Defiant subscribed for by the nurses last year, which later crashed in action against night raiders. The second one will be named *Night Duty*.

The presentation was made by Miss Charters, the Matron of the Wadsley Mental and Wharncliffe Emergency Hospital, Sheffield, the hospital which contributed nearly £1,400, the largest individual subscription to the Fund. It was received on behalf of the R.A.F. by a recently decorated night-fighter pilot, to whom Miss Charters said, when she presented the cheque:—

"These two aircraft the Nurses of Great Britain proudly dedicate to the service of their country, in memory of one gallant pilot, who, in a great company of others, gave his life in defence of the hospitals and homes of Britain. Today the nurses remember him, and them, and as far as we are able, we repay."

With their latest gift, the nurses of Great Britain have brought their total subscriptions to the two Funds organised by the *Nursing Mirror*, the weekly nursing paper, up to just on £20,000. The first Fund, which raised over £8,000, bought 14 motor ambulances for the R.A.F., as well as the night-fighter aircraft, and the present Fund, besides buying the two Spitfires, has in addition over £1,000 to present to the R.A.F. Benevolent Fund, in memory of the pilot of the original *Nightingale* who lost his life.

As before, nurses from every part of Great Britain subscribed to the Fund, in sums ranging from 6d. to well over £1,000 (combined hospital subscription).

BEHIND THE LINES

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Raw Materials

NEW regulations issued by the Führer for the protection of war economy place a particular emphasis on the supplies and stocks of raw materials. Firms are not allowed to lay in stocks in excess of a permissible maximum for current production. Liability to punishment for a contravention of these regulations is not confined to the owner or directors, but extends to the administrative officials responsible for the supplies of the firm.

Lufthansa Report

A SURVEY of activities in 1941 shows the withdrawal of aircraft from the Hansa's air fleet for the use of army transport. The carriage of passengers was severely curtailed to allow additional space for freight. The increase of personal luggage was due to the movements of Nazi officials and officers. The volume of mail carried, mainly to the German forces in the Balkans, in Scandinavia and for prisoners of war, shows a sharp increase over that of 1940.

Verboten

IN their efforts to expand further their production capacity the Germans are apparently facing serious difficulties in the supply of the necessary machine tools. For this reason the manufacture of various machine tools has been prohibited by a special Order, which took effect on April 22nd. Machines for the production of paper clips, drawing pins, upholstery nails, hairdressing pins and clips, etc., are strictly "verboten."

In this way the German authorities expect to increase the capacity for the production of what they call "bottle neck machines" which are to fill the gaps in their machine tool industry.

MALTA'S AGGRESSORS : Crews of the "Death's Head" Squadron preparing for a raid on Malta. In the background are Junkers Ju 88s.

Japan's Air Force

AN important change in the organisation of Japan's Army Air Force has been decided by the Japanese High Command. The present Army Air Corps is to be changed into an Air Division, under the command of a Lt. General who will be directly responsible to the "Tenno." The Chief of the Army Air Division will be in charge of all Army Air units, their mobilisation, training and equipment, and will be consulted on all major military decisions.

The new status and wide powers of the Army Air Chief indicate a step towards an independent Air Force, while the separation from the Naval Air Arm is still rigidly adhered to.

Junkers Training

THE Junkers system of training apprentices does not differ very much from the methods accepted in major industrial firms in this country. Pupils are accepted at the age of 14 and after a test of their abilities are given a general course of training lasting one term. The pupil then passes to productive labour in the factory and, after a period of six months, joins one of the specialised training groups. A course in glider construction is compulsory for all trainees at the end of the first year's training. The entire course lasts for 3½ to 4 years, at the end of which the young apprentice passes out as a skilled craftsman.

It is significant that all trainees receive training in gliding, and have to reach the minimum standard required for the glider-pilot's "A" licence.

MADE IN JAPAN : A Kawanishi T94 twin-float seaplane coming aboard.

Labour Discipline

FROM a recent Order issued by the "Trustee for Labour" for lower Austria, it appears that the Austrians do not display particular keenness in their war effort. The Order, which was published in the periodical *The Comradeship of Labour*, states that a great number of offences by workers in the war industry has been noticed, particularly lack of punctuality, absenteeism and unruly behaviour against works authorities. Works managers are therefore empowered to punish such offences against labour discipline and the safety of industry with fines, irrespective of any existing legal procedure.

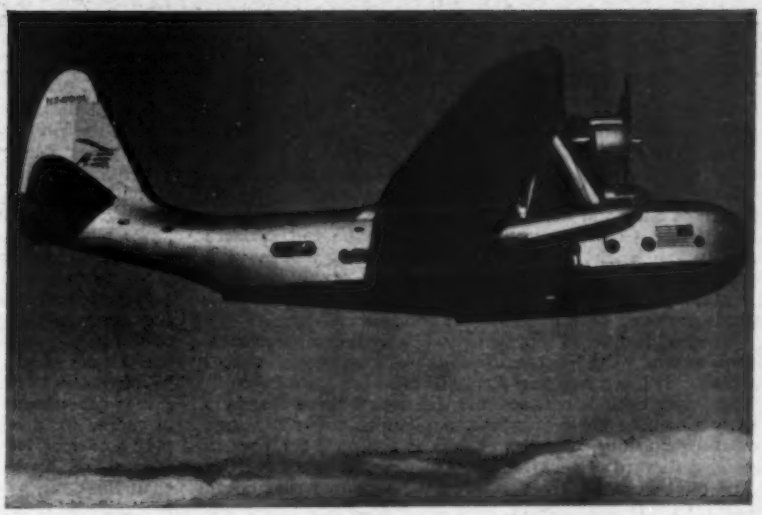
Light offences, such as unpunctuality, should at first be counteracted by a warning. More serious offences, such as repeated unpunctuality and unexcused absence, are to be punished by a fine equivalent to half of the average daily wage. Those guilty of unruly behaviour against the works manager or any of his nominees will be fined one day's wages.

It is interesting to note that the Order, which took effect on April 1st, is limited to the district of lower Danube (excluding Vienna), where the Nazis have established a number of new war industries.

SIKORSKY VS-44-A

New American Long-range Flying Boat for Non-stop Atlantic Service

By H. W. PERRY



The first VS-44-A was christened *Excalibur*. It has four Pratt and Whitney 1,200 h.p. engines. Another flying view was published in our issue of March 5th.

NON-STOP air services between New York City and Foynes, Ireland, are being inaugurated under a temporary certificate of convenience and necessity granted last February by the Civil Aeronautics Board to the American Export Airlines. The certificate authorises the company to operate over the direct route, and also grants permission to make stops at Hamilton, in the Bermudas, at Horta in the Azores, and at Lisbon, Portugal, on the southern route when bad weather makes flying the shorter northern route inadvisable.

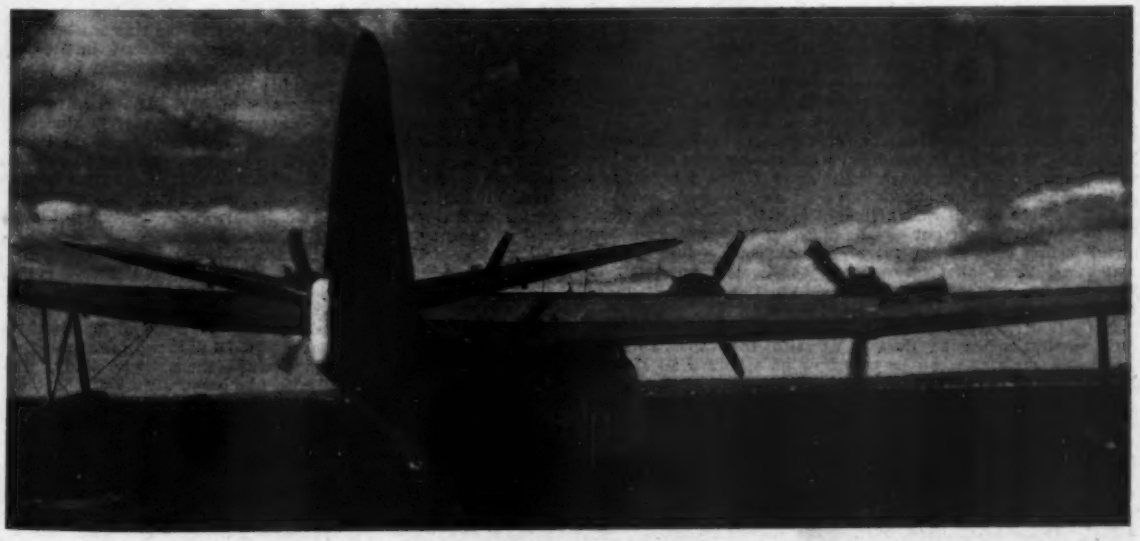
Three forty-passenger, four-engined, high-speed flying boats will be used in the service. They were designed by Igor I. Sikorsky under an order placed in December, 1939, with the Vought-Sikorsky Aircraft Division of the United Aircraft Corp., and the first machine, launched at christening ceremonies at Stratford, Connecticut, last January 17th, performed satisfactorily in flight tests the following month.

It is recalled that the first commercial American air routes across the Atlantic and Pacific Oceans were surveyed, and the services started, by Pan American Airways with Sikorsky aircraft. The American Express Airlines, incorporated in April, 1937, made one round-trip survey each of the northern and southern transatlantic routes and a combination of the two during the late spring and summer of 1939 with a new Consolidated Model 28 PBY flying boat.

Chronology of the principal steps taken to establish the new airline shows that nearly five years elapsed after filing the first application for authorisation to conduct transatlantic commercial flights before the certificate for the New York-Foynes route was granted. Applications were made or amended, owing to war conditions, for routes to Mediterranean ports, Portugal, Spain, France, England, Germany, Italy, Greece, Egypt, and, finally, to Ireland.

An order for preliminary design of four-engined, long-range flying boats for non-stop flights, with an option for the building of three, was placed with Vought-Sikorsky in December, 1939, and the fleet was nearing completion in November, 1941, less than two years later. Meantime, long-term leases for an air base and hangar at La Guardia Field, N.Y., and for passenger-booking space in the new Airlines Terminal building in New York City were signed by the American Export Airlines last summer. The first of the three flying boats to be launched was named the *Excalibur* at the christening in January this year.

The new sister ships are capable not only of flying the Atlantic non-stop but are believed by the builders to be substantially faster than any other large flying boat, and, according to the designer, can break world's records in several international classifications. They are powered



***Excalibur* at moorings on Long Island Sound. There is daytime accommodation for 40 passengers, sleeping berths for 16. A crew of nine is carried.**

SIKORSKY VS-44-A

with Pratt and Whitney 1,200 h.p. engines driving Hamilton Standard fully feathering, three-bladed airscrews; have a top speed of 235 m.p.h. and a non-stop range of 3,000 miles with full load at a cruising speed of 200 m.p.h.

They are all-metal double-deck craft having an overall length of 80ft. and a wingspread of 124ft. Their size may be inferred from the statements that "the tail surfaces rise to the height of a three-storey building and have a greater area than the total surface area of an ordinary military pursuit ship" and that "more space per passenger is provided than in any other commercial aircraft."

The hull is divided into twelve watertight compartments, each of which can be closed in event of damage that causes a leak. It has a two-step flat bottom to facilitate take-off. The upper deck is reserved for the use of those members of a nine-man crew of pilots, navigators and radio men who are on duty. The lower deck is equipped for passengers, a steward and a stewardess, mail and express parcels. The photographs show a tapered wing of long root chord and relatively thin section, with engines mounted considerably ahead of the leading-edge. Pontoon floats suspended well out on the wing are non-retractable.

Special provisions were made to ensure passenger comfort on the long non-stop flights. The seats are 40in. wide, have adjustable cushions, and can be converted quickly into full-size beds. There are large full-view windows and individually regulated heaters at the seats, smaller windows at the upper berths, and individual reading lights in both lower and upper berths. The sleeping arrangements accommodate sixteen passengers. Sleeping quarters for the crew are in a separate compartment forward. Hot meals prepared in a fully equipped galley will be served *en route*. Compartments for mail and other cargo are located forward of the galley, in the wing and in the tail section.

Planning of the entire electrical system was supervised by engineers of the Airline company. Two main engine-driven generators and an auxiliary generator produce 15 kW of energy for driving twenty-nine electric motors and supplying current for the hot-water heating system, the galley ranges and appliances, and eighty electric lights. More than three miles of wiring is used in the system, exclusive of the radio equipment, which consists of twenty-nine individual units, some of which were designed and built by technicians of the airline.

BOOK REVIEWS

The Book of the W.A.A.F. (*Associated Press, 1s. 3d.*)

THIS neat little handbook is a companion volume to the "A.B.C. of the R.A.F.", and is on very much the same lines. It gives a very full account of the work which women are doing for the Royal Air Force, and of the sort of life they lead in the Service. Very useful features are the lists of trades in which women can be employed, and of the pay and allowances.

Yet the book does not scorn to give instruction on the care of hair, and other essentially feminine interests. It is extremely well illustrated with photographs, and has Forewords by Air Chief Marshal Sir Charles Portal, Chief of the Air Staff, and Air Commandant Jean Trefusis Forbes, Director of the Women's Auxiliary Air Force.

"Spitfire!" By Sqn. Ldr. "B. J. Ellan." John Murray. 5s.

THE pen name of "B. J. Ellan" hides the identity of a fighter pilot who joined the R.A.F. during the expansion in 1935 and who was posted overseas before the proofs of his book were passed for press. It tells the day-to-day story of his air battles in a Spitfire right from the start of the air war, through Dunkirk and the Battle of Britain, and it tells it in a simple, unaffected way which has nothing to do with "shooting a line," although the author says, in his introduction, that he is doing just that by writing about his own activities. (Incidentally, his choice of pen name reminds us of "A. J. Allen," who could also tell a story remarkably well.)

He bagged his first Hun just off Calais. "I felt happy," he says. "I had often wondered what it would be really like to shoot at an aircraft and bring it down. Now I knew, and it was definitely exhilarating."

Towards the end of that first fight he was attacked by three Me 109s when almost out of ammunition and petrol, and "an awful feeling gripped the pit of my stomach"—but he outmanœvred them, shot down one with the last burst left in his guns and managed to get away from the others by using the emergency boost.

Not often does the young author touch upon his personal feelings, but when he does it is with the same effective simplicity, such as when he tells how he attacked an Me 110 limping home on one engine ——" Somehow, feeling a bit of a cad, I took very careful aim, checked the range, and pressed the firing button. Nothing happened." He was out of ammunition. So he did a barrel roll over him, looking down at the pilot from the inverted position above him, and then slid down on the other side of him. "He must have had the fright of his life—— I think he must have thought I was playing cat and mouse with him and I suddenly felt sorry for him." Then he flew across his nose and rocked his wings before flying away ——. "Paradoxically in a fight I always hoped the other chap was a decent sort of guy." This is one of those books you do not want to put down till you've finished it.

The Royal Air Force in the World War, Vol. 1. By Capt. Norman Macmillan, M.C., A.F.C. (Harrap, 10s. 6d.).

CAPT. MACMILLAN has set himself a big task to write an unofficial history of the R.A.F. in this war. He has made a good start, and his first volume takes us up to the campaign in Norway. He starts off long before the outbreak of war, describing Hendon displays, Royal inspections, air exercises, and so forth. One notices an occasional slip, e.g., on page 47, describing the Fleet Air Arm before 1937, he writes: "70 per cent. of the flying personnel (was) drawn from the Navy and 30 per cent. from the Royal Air Force." Instead of "flying personnel" he should have written "pilots," for all the observers were naval officers. On page 62 he gives our 1927 Schneider win to a Rolls-Royce engine; it was a Napier. But the amount of detail which Capt. Macmillan has collected about the operations in the war is amazing, and we have no doubt most of it is accurate.

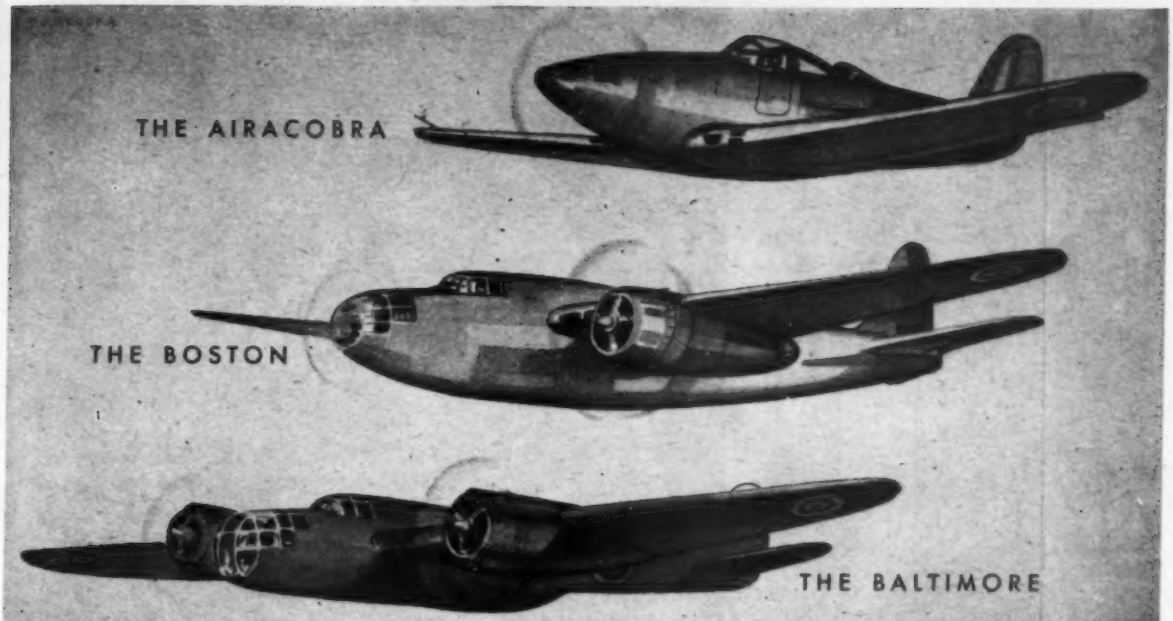
Wings Over Olympus. By T. H. Wisdom (Allen and Unwin, 9s. net).

APART from the epic Battle of Britain, the most picturesque side of the Royal Air Force's part in the war has been in the Middle East. Its work in the Western Desert, in Greece, and in Crete, with all its triumphs and tragedies in those Mediterranean lands has a quality of colour which is hardly so vivid in any of the other theatres of war. It was fortunate for the R.A.F., and also for other people who may be students of the war, that in the Middle East Command one of the Press Officers was Squadron Leader Wisdom, an accomplished journalist. He has made this book largely a personal narrative, but has skilfully used his own experiences, as a good war correspondent should, to give a picture of the fighting in Libya and in Greece and Crete.

For most of the time he lived with No. 211 Squadron (Blenheims), first in the desert and afterwards in Greece. There the squadron was stationed on an airfield at Paramythia, which the author happily translates as "The Valley of Fairy Tales." In the spring it was so lovely with wild flowers that one pilot said he hated having to land there and crush the lovely blossoms. Hurricanes joined them there, and "the Greeks, with their grand sense of humour, were saying that there was now at last work for the sixth man in the crew of the SM79—the 'Hurricano Man.' His job was to give the word to the other chaps to bale out as soon as he spotted a Hurricane."

As one would expect, the R.A.F. loved the glorious Greek soldiers and did all it could to help them. When Germany joined in, the R.A.F. sacrificed itself. No. 211 was all but wiped out in an unescorted raid on the Monastir Gap. The evacuation is described with details one has not heard before, and then comes the fighting in Crete.

This is a fascinating book which tells many things one had always wanted to know.



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JAPAN'S STRATEGY

The First Phase : The Battle for the Indian Ocean : Communications and Islands

By V. L. G.

JAPAN'S strategy was once compared with a play in which the stage of the theatre shows a cross-section of a house of several floors. On each floor a different dramatic action is taking place, but all of them combine to a composite picture. To the audience, however, whose attention is focused on a single action on one particular floor, it is not easy to spot the common thread running through the various actions staged. But although Japanese strategy thus appears to be split into a multitude of fragments, their co-ordination cannot be overlooked upon a closer examination.

For a better comprehension of the main scene of the strategy, one has to turn back to the initial stage of Japan's aggression.

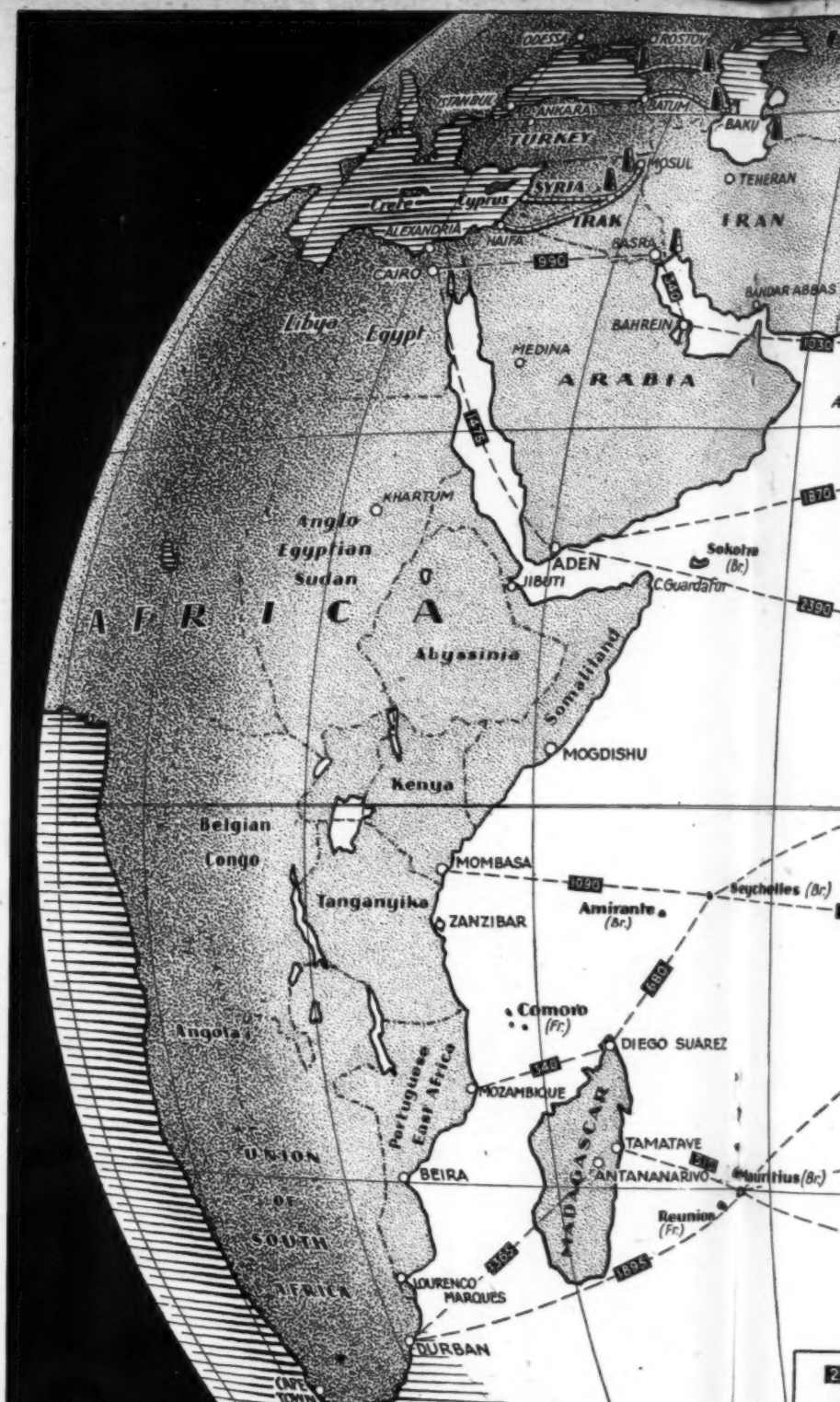
Years of bitter fighting against China have seen Japan's forces advancing only slowly into the enemy territory. But for their gain Japan had to pay heavily in man-power, equipment and munitions. Her economic life has been keyed up to cope with the demand of the war, while the standard of her population has been drastically and continuously reduced. Yet during these years of what the Japanese call juntsey economy, Japan managed to organise an industry capable of producing her war weapons and of creating an air force numerically superior to that which the Democracies could then muster.

Foreign Supplies

The backbone of her war potential showed a conspicuous dependence on foreign supplies of raw materials, so much more dangerous to her as coming mainly from foreign sources which could be effectively closed to her. Because of her isolated geo-political situation, Japan's position was worse than Germany's, and were it not for the willingness of the United States and Britain and the Dutch to supply her, almost until the outbreak of hostilities, with essential raw materials, her industry would have been unable to produce the weapons with which she is now striking.

Although Japan had managed to accumulate substantial stocks of war material, in the face of the Allied superiority in war potential, she was obviously bent on levelling up her material disadvantages by pre-calculated, sudden, and swift striking. The primary object of Japan's strategy was, therefore, the improvement of her war economic potential by the conquest of new raw material resources necessary for the extension and continuation of her aggression. The main weight of Japan's strategy was, therefore, directed to the capture of the rich resources of Malaya and the Dutch East Indies, from which she could draw on materials to bolster up her anæmic war potential.

Local numerical air superiority, supported by the control of close-by air bases in Indo-China and Thailand, permitted the employment of short-range aircraft. Essential importance of this strategy scheme was the concomitant move to push the United States back to the Eastern Pacific, to cut the communications on lines between the British Empire and Australia and the U.S.A., and to secure the domination of the South China Sea. To a considerable extent these plans have been translated into reality. Axis



commentators admit that this was facilitated by special circumstances; first, because of the inadequate air strength of the Allies; secondly, because Russia was involved in the West; thirdly, on account of Japan having the initiative; and last, but not least, the fifth-column work organised beforehand.

While the reasons underlying Japan's progress in the Pacific area are outside the scheme of consideration, one should not omit yet other circumstances fundamentally responsible for the development of the war in the Far East: the fact that American foreign policy, being essentially a peaceful one, wavered from the idea of remaining east of the 180th Meridian and avoiding a clash with Japan to a more realistic conception of a Pacific Defence Triangle Hawaii-Philippines-Guam.

The practical recognition of this factor came too late, and enabled the Japanese to consolidate their air and naval barrier over a line of some 3,000 miles from the furthermost north to the southern point. With the fall of Singapore and the Philippines the Japanese have established a second screen to the west of the China Sea. Their domination of both seaboards of these waters has given them a net of air

Goodrich Castle . . .

on the Wye, was built early in the 12th century and remains today in fairly perfect condition, showing some fine walls and towers. A most notable feature in the external defences is the finishing off of corner towers with projecting triangular buttresses to give extra strength to the most exposed angles. Goodrich withstood many assaults and saw the glitter and colour of grand pageantry in times of peace, but its greatest days were its last—when it resisted the Parliamentarians in the Civil Wars 1642-46.

There are new trials for strength in buildings today—traffic vibrations, and the endless throb of fast-held massive machinery, to mention but two—and the modern architect's translation of feet thick walls and buttresses is a framework of *steel.*

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STRUCTURAL ENGINEERS

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JAPANESE STRATEGY

bases from which the operational radii intersect and cover the whole of this sea.

These self-apparent strategic gains achieved by Japan, even if of a temporary nature, certainly add to the difficulties of the Allies in the Far Eastern war zone. But Japan's gains have by no means caused a complete disruption of trans-pacific communications. So long as the United States' air and naval bases in the Hawaian Islands are in operation, naval vessels and aircraft based on these islands will be able to utilise American and Allied controlled islands south and south-west of Hawaii by way of a detour.

The Battle for the Indian Ocean

The eruption of the Japanese into the Indian Ocean, which is also to secure the Western flanks of their Malayan conquests, is yet another fragment in their composite strategy. The relatively easy gains in the Pacific have presumably encouraged Japan's military clique to widen the scope of their famous Co-Prosperity Scheme. With the presence of Japanese forces in the Gulf of Bengal and the attack of Japanese naval air units against Colombo, a new phase of the campaign has opened.

The strategic plan is based on three arms, directed against Calcutta, Madras and Coconada and Vizagapatam, while yet another was thrust against Trincomali and Colombo. The dangers of this thrust cannot be ignored. For a further advance of the Japanese into the Indian Ocean can have grave consequences, not merely to the local developments of war, but on the wider issues of Allied strategy.

The Indian Ocean is a highway radiating from the South Pole and connecting the most southern areas of the world. Accessible from the large oceans of the world, it is a first-class Empire route joining South Africa with Australia and India. Of particular significance is the Indian Ocean to the maintenance of communication between the U.S.A. and the Middle East. In its extension it is also essential for the maintenance of the Allied supply line to Russia and the security of the South African Dominion.

The wide space of the Indian Ocean is dotted with islands, the position of which has hitherto guarded the security of this highway. Chagos Islands, Rodriguez, Mauritius, the Seychelle and the Amirante groups are the most important. With Japan's advance into the eastern periphery of the Indian Ocean, these islands have been brought within the radius of war. A further Japanese expansion would undoubtedly be aimed at securing the possession of these islands and thus interfering with the vital communication lines of the Allies.

Whether they will be successful in this venture depends largely on the extent to which facilities for the operations of Allied Air Forces have been developed. The little dots on the map are far more important than they appear to be; they must serve the Allied Air Forces as operational bases for the hammering of Japan's air and naval power when they venture into the South-Western Indian Ocean.

The first step in this direction has been taken with the combined British sea and air operations for safeguarding Madagascar. The initiative taken may well prove to be of the utmost importance to further developments in the Indian Ocean. For hitherto—as the Japanese admit themselves—they had the advantage of the initiative, thus forcing the Allies into defensive positions not always favourable to them. Madagascar and its dependencies, among them the Archipelago of the Comores Islands, are situated about 250 miles from the African Coast. The island is bigger than France, Belgium and Holland, and is reported to have favourable areas for the establishment of airfields.

Ever since it was first discovered in 1500 by a Portuguese traveller, its significance to the maritime traffic has remained unchanged. In the present struggle for the domination of world routes, Madagascar's proximity to the African Continent and the vital supply lines of the Allies gives it a key importance. Under Vichy control it would have been too great an attraction for the Japanese.

Once Allied control is established in Madagascar an important step towards limiting Japan's advance will have been made. But to prevent any further infesting of the waters of the Indian Ocean by the Japanese, the security of other islands in this sea must be made unchallengeable.

P.T. FOR THE A.T.C.

Many More Camps this Year

PHYSICAL fitness has always been regarded as of first-rate importance for the Royal Air Force, especially for pilots and air crews, and therefore health training has always formed part of the curriculum of the Air Training Corps. Now a new scheme of standardised physical tests is being introduced into the A.T.C., based on the standards of the Board of Education, and ultimately the proficiency badge, which is the object of every cadet's ambition, will not be awarded unless the cadet qualifies in the physical tests as well as in his classroom training.

When the lads first join the A.T.C. they are examined by honorary medical officers, but when they pass on into the Royal Air Force they have to go before a medical board and satisfy its exacting requirements. In the years between 16 and 18 a youth may develop physically to a very great degree, and it is the aim of the A.T.C. to help on that development in a sensible manner, and without strain. It has always been the aim of the organisation to make work and progress attractive (for instance, mathematics is a word which fills many with consternation, but the A.T.C. substitutes the term "flying calculations," and at once the subject becomes attractive to every cadet), and the same principle is being applied to the physical training. No expensive gymnastic appliances are needed, except swimming baths, of which there are plenty about the country. In spite of rubber dinghies and Mae Wests, swimming is an accomplishment now thought highly desirable in the R.A.F.

At present the standards set are experimental. The intention is to make them neither too easy nor too hard. The A.T.C. is not aiming at turning out Olympic champions, but at a good average level of physical fitness. The tests are naturally lower for lads of 16 than for those of 18. For instance, a lad of 16 gets a pass in the 100 yards sprint at 14 seconds, while one of 18 is expected to do the distance in 13 secs. In the running high jump the younger lads are only asked to clear the modest height of 3ft. 6in., while the older ones are expected to clear 4ft. But it is not intended to make these tests too rigid; the great thing is to improve a lad's physique while he is in the corps, and one who fails at first but afterwards improves his condition and succeeds will certainly learn to feel considerable confidence in himself.

This summer there will be many more A.T.C. camps than there were last year, each as near as possible to the most convenient R.A.F. station. It is hoped that each cadet will be able to spend at least a week at a camp, which will give him a fair insight into the daily work of the R.A.F. During the camps as many cadets as possible are taken into the air, though, of course, they are not allowed to go on operational flights against the enemy.

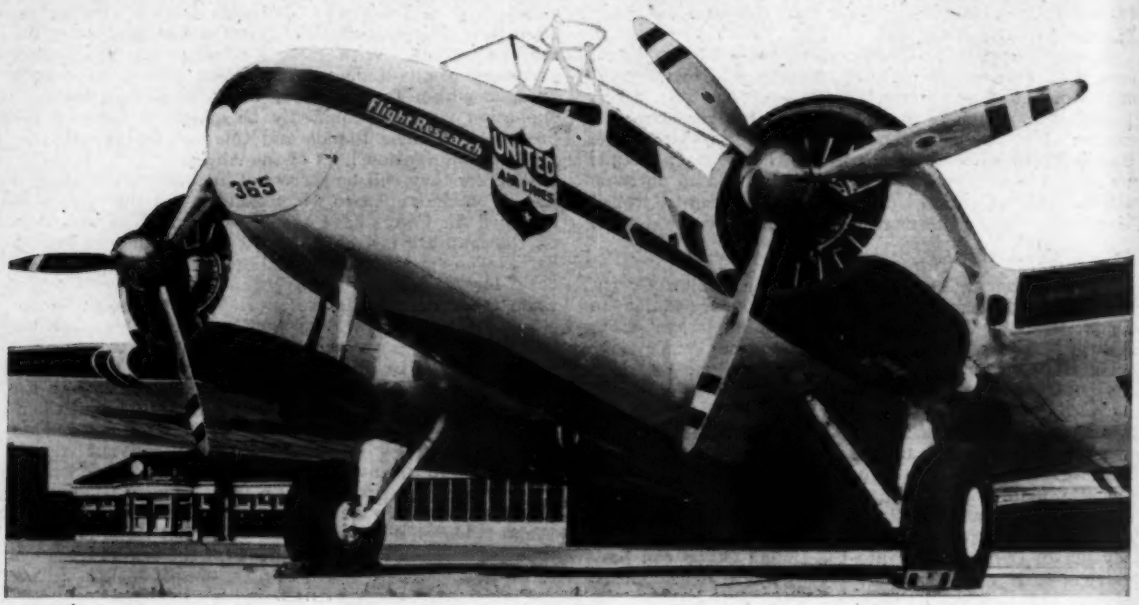
News for the R.C.A.F.

THE Royal Canadian Air Force now has its own newspaper in this country. It is called, very appropriately, *Wings Abroad*, and is published from their headquarters at 20, Lincoln's Inn Fields, London, W.C.2.

New newspapers are a distinct rarity these days, but this one is not, strictly speaking, an addition to their ranks, for, as explained in the leading article of the first issue, it is really an expansion of the paper of the same name successfully published for some time by 400 Squadron R.C.A.F.

Its predecessor was essentially a squadron news sheet, but the new version has been expanded in its scope for the benefit of all Canadian airmen on this side of the Atlantic, and will no doubt be welcomed by them.

A NEW LOCATION RECORDER



A FLYING LABORATORY: A United Air Lines' twin-engined machine (Boeing 247-D) in which research work on radio communication is conducted. The seats were removed from one side of the cabin to make room for the test equipment shown in the picture below.

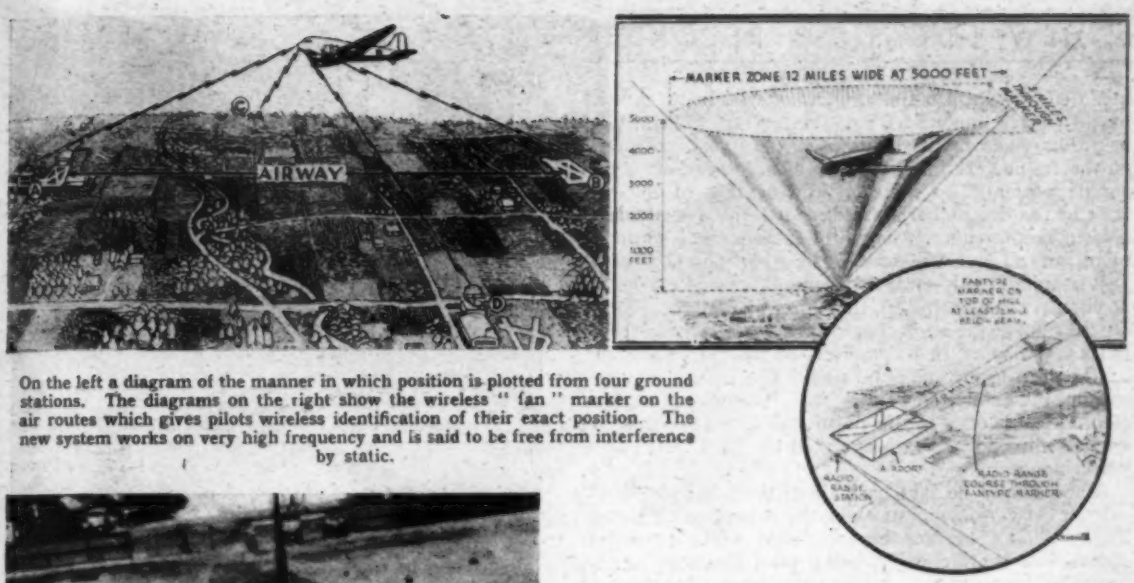
American Firm's Device for Keeping Track of Airline Machines : Lengthy Research Brings Success : Short-wave Equipment Used for Long-range Direction-finding by Ground Stations

THERE is, of course, nothing new in employing wireless direction-finding for plotting the position of an aircraft at any given moment. The system grew up with the development of the aircraft themselves; that is to say, as aircraft engines became more and more reliable, scheduled flights were undertaken in more and more unfavourable weather conditions. By the time the present war started, the system was working satisfactorily on the British and European air routes, and even the take-off and landing could be accomplished by means of wireless.

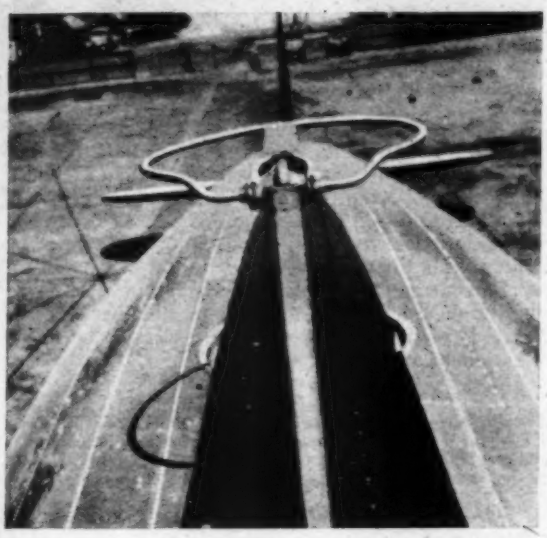
For the location of an aircraft at any point along its route, two distinct systems were available: either ground stations (a minimum of three for accurate results) could transmit signals which were picked up by the aircraft, which carried direction-finding equipment on board, or the aircraft could transmit and the ground stations take a directional bearing on it, so that from the known positions of the stations and the direction from which the aircraft's signals reached each, they could, by triangulation, work out the location of the aircraft and transmit the information to the pilot. The former system was rather more rapid, in that the ground stations did not have to communicate with one another before the "fix" could be given, but it entailed the carrying of more equipment in the aircraft.

The actual landing by wireless guidance was by beams sent up by so-called marker beacons set up in the line of approach some distance away from the airfield. When the pilot heard the "pips" in his earphones he knew that he was over the outer marker beacon, and that he had to lose a certain amount of height by the time he passed the inner marker

Interior of the flying laboratory, with work bench and test stands.



On the left a diagram of the manner in which position is plotted from four ground stations. The diagrams on the right show the wireless " fan " marker on the air routes which gives pilots wireless identification of their exact position. The new system works on very high frequency and is said to be free from interference by static.



Mounted on top of the fuselage is a retractable aerial. This is used in instrument landings.

beacon if his approach path were to be quite correct.

In the United States a somewhat different system was used, and radio beacons were placed along the main air routes, the pilots being guided by the beam signals much as, in the earlier days, they were guided by visual light beacons.

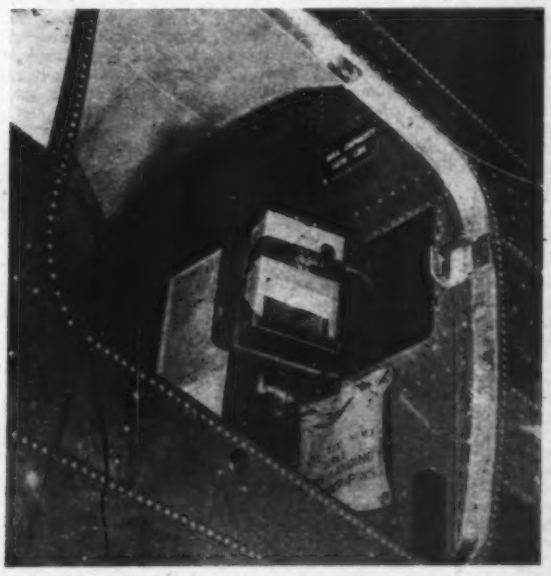
U.A.L. Research

One of the American operating companies, United Air Lines, has been working for many years on the problem of safe navigation of commercial aircraft, and has now reached a stage when ultra-short wave wireless can be used reliably not merely for two-way voice communication but for continuous recording of the location of an aircraft on the route.

Before the new system could be accepted as thoroughly satisfactory a great deal of research was necessary. In the early stages this was, of course, undertaken in ground laboratories and workshops, but when the main details had been worked out it became advisable to make tests in the air, and a commercial aircraft was obtained and converted into a flying laboratory. The seats were removed from one side of the cabin and a work bench and test stand were installed instead. It was not long before this flying laboratory became a familiar sight on the air routes, and often the manufacturers of instruments and wireless equipment arranged with United Air Lines to test some new device for them.

When thorough tests had been made in the air of transmission and reception on the ultra-short waves, an experimental aircraft location recorder was produced by United Air Lines engineers. This was demonstrated successfully before experts. The next step was to design a unit which could be produced on a commercial scale. This has now been done, and units are ready for installation at points along U.A.L. coast-to-coast and Pacific-coast routes this spring and summer.

The ground recorder station has a large frame aerial

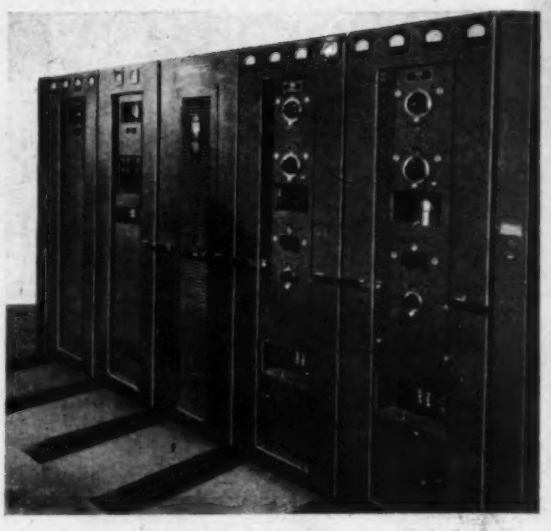


So-called " flight analysers " are carried in the aircraft to provide records of altitude, climbs and descents on a flight. The records are examined by despatchers at the end of each trip.

A NEW LOCATION RECORDER

mounted on top of a building, the aerial being rotated by an electric motor. When the aircraft transmits on its ordinary short-wave equipment, the signal is received on the frame aerial and equipment associated with this aerial automatically indicates the bearing of the aircraft in the despatcher's office. Thus the despatcher is able to keep a running record of the aircraft. Three or more ground stations working together can take bearings simultaneously and, by triangulation, ascertain the position. The system can, therefore, be used for informing the pilot of the aircraft of his position at any moment, but it can also be used as a check on his course-keeping, as the bearings can be taken by the ground stations without the knowledge of the pilot. The ground location recorder supplements the normal devices, such as the wireless directional beam operated by the U.S. Federal Government.

A word may be said here about the wireless "fan" markers at various points along the American air routes. These "fan" marker beacons send vertical wireless signals into the air, and when a pilot flies over one he hears a "beep-beep" in his earphones. A warning light also lights up, so that if he should miss the aural signal he will see the visual one. The "fan" being of known angle, the pilot will know from his altitude how long, at a given speed, he should take to cross one. For instance, at an altitude of 5,000ft. the beacon signal zone is 12 miles across and three miles wide. Six of these fan-type markers have been placed at strategic points along the air route between Vancouver and San Diego. They are located at Hobarts and Park Lane, Washington, Bay Point, Livermore, La Habra, and Newhall Pass, California.



One of United Air Lines 5-kilowatt transmitters used by ground stations for two-way wireless telephone communication.

The United Air Lines main communications research laboratory is situated at the Chicago airport and is under the direction of Mr. J. R. Cunningham. There is a staff of ten engineers and a mechanic. Mr. P. C. Sandretto, a young wireless engineer with an impressive record of achievements in the development of air safety aids, is superintendent of the laboratory, which is devoted exclusively to the origination and development of new devices, the study of new equipment and of improved methods of communication in air transport.

A Method for Purifying Scrap Magnesium

CORROSION-RESISTANT pure magnesium can be recovered readily from scrap magnesium containing iron, nickel or copper by a vaporising and condensing process patented by Charles E. Nelson and assigned to the Dow Chemical Co., of Midland, Michigan. The patent reveals that the scrap is melted in the presence of calcium, lead, tin, antimony or bismuth until the magnesium alloys with the metal chosen, then the temperature is raised sufficiently to vaporise the flux. As the vapour issues from the retort it is filtered through oxide of calcium or of aluminium and then condensed in metallic form free of impurities on a tube through which cold water flows.

Improved Air-cooled Engine Cowling

THE National Advisory Committee for Aeronautics has worked for years in its laboratory at Langley Field, Virginia, on the combined problem of cooling radial engines and reducing aircraft drag Its early solution was the very effective ring cowl, which has been long in universal use with radial air-cooled engines. But two difficulties remained: one, that the rate of airflow over the cylinder fins at low aircraft speed was not rapid enough to effect sufficient cooling; the other, that at high speed the engine housing still presented too much drag.

Now, improvements in the cowling induce maximum airflow across the engine at low speed and reduce external air resistance at high speed to a minimum, according to the specification of a patent issued last January to Theodore Theodorsen, a research engineer in the N.A.C.A. laboratory, who grants free use of the invention to the United States Government.

The improvements consist, as described, in providing air outlets in the cowl at the points where internal pressure and external vacuum, produced by flow of the airstream over the cowling surface, are highest. The air current entering the circular front inlet flows rearward over the engine, then reverses direction and moves forward in a cylindrical stream surrounding the central current and is drawn out by vacuum through the outlets arranged annularly in the cowling shell. The vacuum increases circulation of the air within the cowling, while at the same time emission of air at the outlets lowers the vacuum there and is said to minimise the drag.

Flashing Light Warns of Icing Conditions

PILOTS entering an air stratum in which the temperature is such as to promote the formation of ice on the wings can be warned to start operation of de-icers or to descend to a warmer stratum by means of an invention recently patented in the United States by Edward P. Hall and assigned to the Square D Co.

Warning is given by the flashing of an electric lamp mounted on the instrument panel. A coil that varies in resistance with temperature changes is mounted on the wing at a location where ice is most likely to form, and is connected with a thermostatic switch, a battery and the lamp.

In operation, the switch closes when the aircraft enters an air region of ice-forming temperature and energises the system so that, as soon as moisture freezes on the resistance coil the circuit from battery to lamp is closed and the lamp lights. Flow of current through the coil, however, warms it and the circuit is broken, extinguishing the light, which again flashes when the coil cools to freezing temperature.

Centrifugal Oil Cleaner for Aircraft Engines

PARTICLES of metal, carbon and gritty soil and clumps of petroleum gum that accumulate in lubricating oil in aircraft engines may be removed continuously while the engines are running by adoption of a separator system developed and recently patented by Alan E. Flowers, who assigned the patent to the De Laval Separator Co., of New York City. A centrifugal-type separator is connected in the forced-circulation oil system of the engine so that oil from the crankcase flows through it and the heavy contaminating matter is whirled out before the lubricant returns to the oil reservoir. Flow of oil under pressure of the oil pump drives an impeller which rotates the centrifugal element of the separator.

Thirty-eighth of the Second Series

FRIEND or FOE?

On British Communications : Percival Q6 and Airspeed Envoy

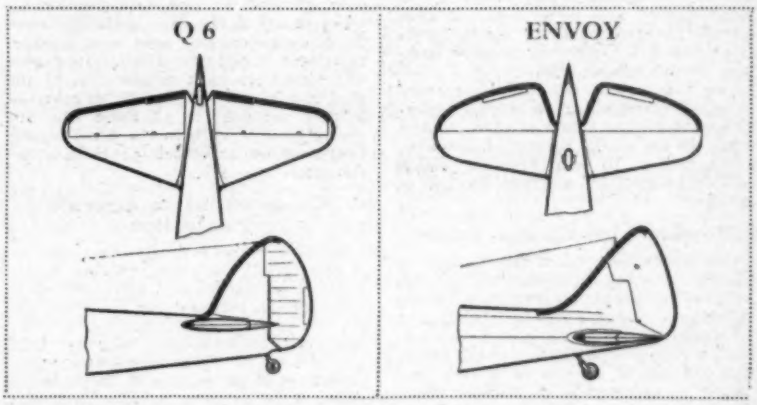
PERCIVAL Q6: Pronounced straight taper to both edges of tailplane and small round tips; well-rounded fin and rudder.

ALTHOUGH nearly six feet greater in span, the Airspeed Envoy bears quite a close resemblance to the Percival Q6 (when the latter is fitted with a retractable undercarriage) when seen from any rear view which conceals the difference in engines. As this happens to be a case in which even the tail assemblies are not strikingly different, identification from this particular angle is trickier than usual.

The Percival Q6 (frequently known as the Petrel, although the name has never received Air Ministry blessing) is used by both the Royal Air Force and the Fleet Air Arm for what are termed "light communications duties." On this page it is illustrated with a fixed undercarriage, but it also exists with retractable landing gear. It would have increased its resemblance to the Envoy to have depicted the latter version, but it seemed more informative to show the trousered type of undercarriage employed in the "fixed" version, since all retractable landing gear looks much the same in flight. Incidentally, although the retractable gear is necessarily the heavier, reduced drag puts about 10 m.p.h. on the speed.

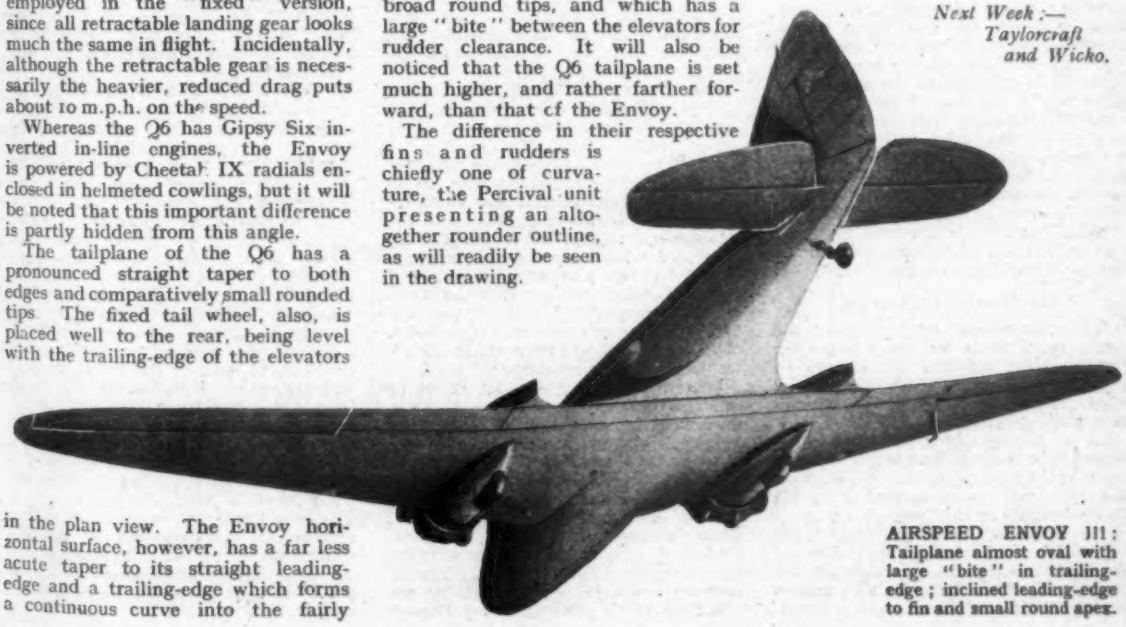
Whereas the Q6 has Gipsy Six inverted in-line engines, the Envoy is powered by Cheetah IX radials enclosed in helmeted cowlings, but it will be noted that this important difference is partly hidden from this angle.

The tailplane of the Q6 has a pronounced straight taper to both edges and comparatively small rounded tips. The fixed tail wheel, also, is placed well to the rear, being level with the trailing-edge of the elevators in the plan view. The Envoy horizontal surface, however, has a far less acute taper to its straight leading-edge and a trailing-edge which forms a continuous curve into the fairly broad round tips, and which has a large "bite" between the elevators for rudder clearance. It will also be noticed that the Q6 tailplane is set much higher, and rather farther forward, than that of the Envoy.



The difference in their respective fins and rudders is chiefly one of curvature, the Percival unit presenting an altogether rounder outline, as will readily be seen in the drawing.

Next Week :— Taylorcraft and Wicko.



AIRSPEED ENVOY III: Tailplane almost oval with large "bite" in trailing-edge; inclined leading-edge to fin and small round apex.

IN PARLIAMENT

Extra Pay for Paratroops : Britain's Bombing Policy : Information on Russian Aircraft : Flying Experience for A.T.C. : Aircraft Output and Supply of Alloys

Parachutists' Pay

Wing-Commander Hulbert asked the Secretary of State for War whether it is proposed to make a special increase of pay to Commandos and Paratroops?

Sir J. Grigg: Parachute troops already get extra pay at the rate of four shillings a day for officers and two shillings a day for other ranks. It is not proposed to increase the pay of Commando troops.

Hitler's Word Valueless

Mr. Hannah asked the Prime Minister whether he will consider, through the International Red Cross or otherwise, attempting to arrange by tacit agreement, or in other way, mutual forbearance to destroy ancient monuments of no military value?

Mr. Attlee: No, Sir. Experience has shown the worthlessness of any agreement entered into by Hitler, and it is already the fixed policy of His Majesty's Government to avoid unnecessary damage to such monuments.

Mr. Hannah: Is not the present condition of the world more utterly deplorable than anything that has been known since the fall of the Empire of Rome?

Mr. Attlee: My hon. Friend's opinion will be shared by a great number of people.

Russian Aircraft and Tanks

Sir W. Davison asked the Minister of Production whether, in view of the large supplies of aeroplanes, tanks and other munitions of war which are being sent to Russia by Great Britain and America, we are receiving particulars of the design and equipment of the aeroplanes and tanks manufactured in Russia which have been so successful against the Germans in the recent fighting; and whether these machines are now being manufactured in Great Britain and America?

Mr. Lyttelton: I regret it is not in the public interest to disclose the information asked for by my hon. Friend.

Sir W. Davison: Will representations be made to the Soviet authorities as to the desirability of all available information as to these aeroplanes, which have been so successful against the Germans, being provided to our industry?

Mr. Lyttelton: I may tell my hon. Friend that our test pilots have flown nearly all the Russian types of machines.

Air Training Corps

Wing-Commander Hulbert asked the Secretary of State for Air whether increased flying facilities will shortly be available to the Air Training Corps; and what progress is being made for practical gliding instruction?

Sir A. Sinclair: It is not proposed to depart from the rule that cadets can only be given flying experience where they can be taken up in aircraft that are making flights in the ordinary course of duty (excluding operational flights), except that it has recently been arranged that special flights may be made for this purpose at certain flying training schools equipped with light two-seater aircraft. As regards gliding, preparations are being pressed on with as rapidly as possible and particulars will be announced in due course.

Wing-Commander Hulbert asked the Secretary of State for Air the procedure for selecting Air Training Corps officers; what qualifications are required; and whether he is satisfied with the results achieved up to date?

Sir A. Sinclair: Applicants for commissions in the training branch of the R.A.F.V.R. are interviewed by an Air Ministry Selection Board on the recommendation of the commanding officer of the unit in which the applicant desires to serve and of the chairman of the local committee or headmaster of the school concerned. Applicants must normally be of British nationality and between the ages of 19 and 55. Commissions are only granted to applicants under 41 years of age if they are medically unfit for general service or have been granted deferment of call-up. The results generally have been most satisfactory. I am glad to take this opportunity of acknowledging our debt to all those who are giving their services to the Air Training Corps, either as officers or civilian instructors.

Co-operation in Aircraft Production

Mr. Ellis Smith asked the Minister of Aircraft Production whether he is satisfied that there is a close and effective contact between the Ministry, the Air Ministry and the industrial experts; is there a direct contact between those who decide on programmes and representatives of the section of the industry called upon to carry out the particular programme; do firms receive orders of types of sufficient numbers to plan for a reasonable time, and on which they can carry on until full arrangements are made to produce other types?

The Minister of Aircraft Production (Colonel Llewellin): The answer to each part of my hon. Friend's question is "Yes, Sir."

Mr. Ellis Smith asked the Minister of Aircraft Production whether he is satisfied that the aircraft and allied industry is working and producing to the maximum capacity; what recent steps have been taken to secure the maximum output; is there a satisfactory system of decentralisation and grouping of firms making common types; and is he satisfied with the arrangements for exchange of advice gained by experience in design, technical and in production?

Colonel Llewellin: I shall never be satisfied that we cannot secure some improvement in the output of the aircraft industry, and it is our constant endeavour, as I am sure it is that of the industry, to secure maximum production. Satisfactory groupings of firms making common types of aircraft exist. Group arrangements exist for the exchange of information on both technical and production matters not only directly between members of the industry but also through the medium of my Department, and we continually try to improve these arrangements.

Mr. Smith: Have the Ministry considered the advisability of setting up representative advisory committees, composed of key-men throughout the industry, in order to advise on methods to be adopted to bring about a greater increase in production?

Colonel Llewellin: There are several committees in the industry with which I am in touch—one a technical committee and one a committee of main manufacturers. When we are making one particular type of plane we have it in that group, and we are in constant touch with the group of manufacturers which are making it.

Aluminium and Light Alloys

Mr. Ellis Smith asked the Minister of Aircraft Production whether the supply of aluminium and light alloys is satisfactory; what refunds have been made by the industry to the Ministry; what is the average profit and are there satisfactory relations between the industry and the Ministry?

Colonel Llewellin: As regards refunds and average profits, there are several industries and several hundred firms concerned in the production of aluminium and light alloys. Price adjustments have in some cases resulted in payment to the Ministry and in others by the Ministry, but the subject is highly complicated and one with which it is not possible to deal within the scope of an answer to a Parliamentary question. Negotiations concerning further adjustments are now proceeding. The answers to the first and last parts of the question are in the affirmative.

Mr. Smith: Can the House be informed of the average profits of the firms in this association which have created so many difficulties for the Ministry?

Colonel Llewellin: There are very large numbers of firms making aluminium and magnesium castings and strips and other different components, and it is very difficult to obtain an average for all of them which would have any real relevance to the facts.

Sir Richard Acland: Can the Minister say whether these people have yet allowed costing officers to go into their factories and find out for themselves what are the costs?

Colonel Llewellin: Negotiations on these price matters are going on, and I have not the slightest doubt that our people have been in the factories, but, without notice, I would not like it to be said that they have.

Sir R. Acland: After more than two years of war, does the Minister mean to say that costing accountants of the Ministry are not yet going to these factories to check up?

Colonel Llewellin: I said I was almost certain that they have been in the factories, but if the hon. Member wishes to have that information and cares to put down a question, I will give him an answer.

"GROUND-FLYING"

A Critical Examination of Some Devices Intended to Develop a Sense of Balance and at the Same Time Familiarise Pupils with Aircraft Controls

By N. NICHOLAS, B.Sc., F.R.Ae.S.

THE Link Trainer has proved itself an admirable device for training pilots in blind flying. Something much simpler might serve to familiarise beginners with the use of the flying controls, although the sensations of flying would obviously be lacking.

AMONG the long list of subjects which constitute the curriculum of the present-day air cadet, actual flying is usually left to the end of the course. But it is desirable to prepare a pupil for his flying lessons, gradually, by training his mentality and purely physical senses in such a way that the first actual flight should not produce any undue strain. It would be much better if this flight were approached as something familiar and easy to understand. For this purpose several devices have been made, mostly in the shape of a pilot's seat with a joystick. When he was a flying instructor the author paid little attention to these devices. But recently he came across several of them, and after careful analysis he has found that not only are they often useless but even harmful to a certain degree. He was thus led to write this article, and hopes that it will produce useful discussion.

A Question of Balance

Those who teach flying usually agree that horsemen and cyclists feel the movements of an aircraft much better than others, and their turning and general manœuvring is more sensitive. If we recognise the fact that the ability to balance one's body can be developed by training (learning to ride a bicycle is a confirmation of this), then our preliminary training must be organised on these lines.

If we can develop this sense of body balance in every cadet before he starts actual flying, and do it in circumstances similar to the flight, then we can save a lot of time, energy and nervous strain for both pupil and instructor. Let us now examine the devices offered:

Fig. 1 shows one of the latest American patents, and by a simple analysis of the joystick movements we can see what is doing. This device is made entirely for moving instruments. The pilot sits still on the flat board, and by moving his arms and legs he produces corresponding movements of the instruments. This will familiarise the pupil with the same, but will *not* make him feel any movements of the aircraft. For blind flying, which is highly specialised and advanced training, this device is too crude; for preliminary training it is harmful because it teaches one to concentrate on instruments only and not on the aircraft itself.

The second device, Fig. 2, is one which has been recommended for our A.T.C. groups, and therefore an analysis of it is most important at present. The seat is suspended on ropes, which are connected to the joystick and pedals. In front is a panel which represents the horizon. Any movement of the stick upsets the level of the seat. If he does not look at the horizon he will make an involuntary movement of the body in the opposite direction to keep himself upright. If he looks at the horizon he will try to level up entirely by sight. Now let us see what is required from the pupil when he takes the stick for the first time to keep his craft on an even keel!

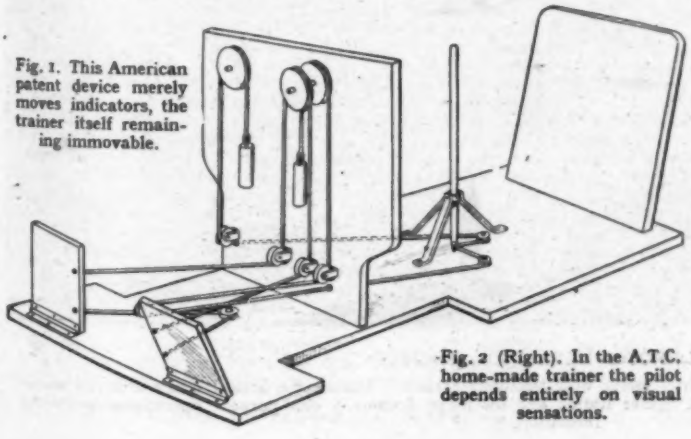


Fig. 1. This American patent device merely moves indicators, the trainer itself remaining immovable.

External forces are upsetting it, and he has two means of noticing this:—

(1) By the general balance of his body.

(2) By the position of the horizon.

It is important to remember that the forces upsetting him are *external*. He has to *feel* them and react quickly and properly. If we choose the horizon as a criterion of level flight, it must be clearly visible and well defined, conditions seldom met with. On the other hand, if he can concentrate on the balance of his body and use the horizon as confirmation only, he will increase his ability to react quickly and accurately.

External Forces

The A.T.C. home-made air trainer has no external forces upsetting it. The pilot upsets himself, and his body balance is not brought into action in the right way. It teaches him to depend entirely on visual sensations and to fight his own movements. After careful consideration the author made a sketch of the "keep-level seat," shown in Fig. 3.

The upright pillar is held by two or more cadets in a vertical position by handles attached to it. The trainee takes his seat, preferably blindfolded, and the cadets begin to rock the pillar. They represent *external forces*, and the pilot has to keep his seat level

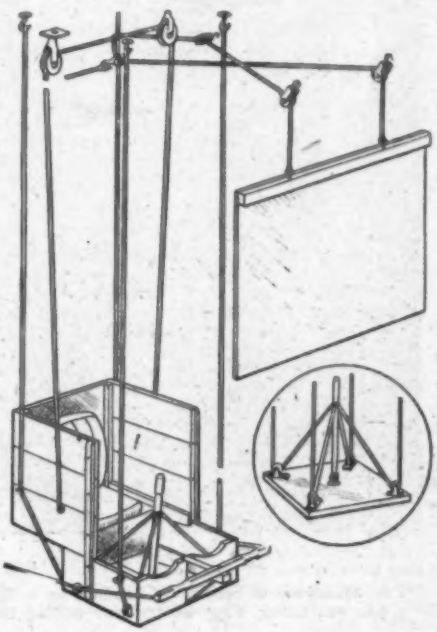


Fig. 2 (Right). In the A.T.C. home-made trainer the pilot depends entirely on visual sensations.

"GROUND-FLYING"

purely by his sense of balance. This device gives a very good opportunity to watch reactions and speed of reflexes of a pupil, and can be generally useful for both instructor and pupil.

During the last war a complete miniature aircraft was mounted on a ball joint, and an electrically driven airscrew produced enough draught to operate the controls. But it had several additional forces, as, for example, gyroscopic effects of the screw which were too much for the beginner, and ultimately it finished its life in an amusement park.

For effective preliminary training it is very important to deal first with the simplest well-defined movements, gradually increasing their complexity, until a full range is reached in the air. Therefore, a mechanical device can be of great help to the instructor and the pupil, provided that the principle embodied in its construction is correct and its operation simple.

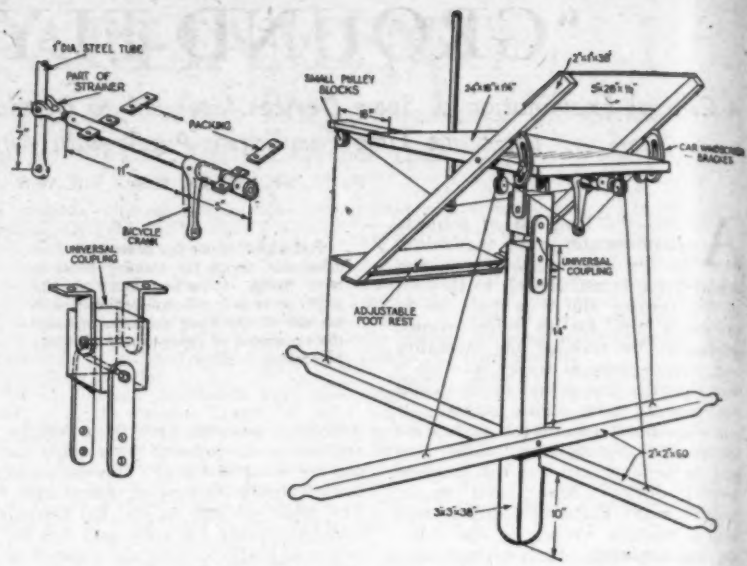


Fig. 3. The author's suggested "keep-level" seat in which two assistants provide the external upsetting forces.

WINGS OVER THE CHANNEL

ROLLS-ROYCE MERLIN XLV ENGINES

Two squadrons of Spitfire Vs heading for a fighter sweep over Northern France. During the occasion on which this photograph was taken, King George was visiting the fighter station and the flight became a dual-purpose operational-ceremonial formation.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

SCIENCE IN "OPS"

Plea for a Special R.A.F. Wing

MAY I appeal to readers of *Flight* to help secure support for the development of a powerful *Experimental Operations* Wing in the R.A.F. to carry out operations that will astound those who believe that the technique of aerial warfare has little scope for extension? *Science* in *operations* is just as important as science in aerobatics or technical science.

EDWARD MILNER.

RADIATOR DRAG

Point of Academic Interest

I AM grateful to P. A. S., Darwen, for his admirably clear exposition of the way in which a radiator can function as a heat engine and develop a forward thrust (*Flight*, April 30th). In the case which he considers, the passages of the radiator are so shaped that (so it is assumed) the preliminary compression of the air takes place by streamline retardation involving no loss of energy.

In practice, of course, there will be some departure from this condition, and there is one particular departure which—at any rate from an academic point of view—may be worthy of attention, and that is the case of a radiator with passages of uniform cross-section from entry to exit. In its simplest form this radiator can be visualised as a straight parallel tube heated from the outside. In this case it would appear that the work done by the heat engine would do no more than compensate for the destruction of some of the kinetic energy of the entering air.

It would be interesting to learn from your readers whether a thrust can be developed in this case and, if so, in what way the force would be communicated to the walls of the radiator.

J. W. CROFTS.

BOMBER ARMAMENT

Mixed Guns Advocated

I HAVE been interested to note for some time a "cannon controversy" in the Correspondence pages of your most excellent journal. Particularly interesting to me has been the letter from B. T. Howard. Mr. Howard seems to be concerned at our apparent lack of foresight or ingenuity in fitting cannon in the power-operated turrets of our big bombers; and also appears to think that, armed as they are at present, they are at a disadvantage when they encounter cannon-armed fighters.

Perhaps this is partly true, but it is offset to a certain degree by the heavy armour carried by our bombers. However, I will not argue the point, as I merely wish to point out, as a practical engineer, some of the difficulties in fitting cannon in bombers' turrets.

The first difficulty is the much greater space needed by the cannon, which are at least half as long again as the machine-guns. This suggests a bigger and heavier turret, as does the greater space required for the larger ammunition boxes and feed arrangements. This, in turn, leads to heavier turret-operating gear and improved and elaborate gun mountings to take the recoil of the heavy ordnance. This cannot be accomplished without added weight. The extra weight and drag of these necessarily massive turrets would have a marked effect on the aircraft's performance.

I can almost hear Mr. Howard remark, "Would all this have to happen if a turret were to have only one or at the most two cannon fitted?" My answer to that would be "rate of fire." The cannon may have a long range, but the rate of fire from a 20 mm. cannon is only about half that of the Browning machine-gun, which constitutes the main armament of our bomber force. With the slower rate of fire, the gunner has less chance of hitting his target because of the smaller area covered by his fire. I think this points out that two cannon are not sufficient in a turret. Added to this the cannon-armed fighter has a much bigger and slower target than the cannon-armed bomber, which has much less chance of hitting a fast-moving and small fighter with its comparatively slow-firing cannon.

Finally, I think that the only practical position to fit cannon in a big bomber is in blister turrets, as in the Fortress I, as a secondary armament to the machine guns. There the gunners have plenty of room, and the guns could be mounted singly on power-operated mounts.

This mixed armament would, I think, prove the most successful as the cannon would be brought to bear at close range, which would prove deadly to the attacker.

G. S. HENDERSON.

HOME GUARD AIR ARM

A Welcome Innovation

THANKS to *Flight* for bringing notice to what undoubtedly could be invaluable assistance to Home Guards, namely, an Air Corps. I feel certain that the controlling powers of the Home Guard would welcome this innovation, small though it might be.

The training of H.G.s is being carried out, in spite of obvious difficulties, with extreme efficiency and versatility is their strong point; they could tackle the organisation of such a corps in their stride.

G. S. Freeman and H. W. G. in their recent letters have certainly "hit the nail on the head," and I, for one, as an "A" licence pilot and H.G., would be interested to hear if the powers that be consider the idea.

W. J. SANDERSON.

More Suggested Duties

WITH reference to "1935 Amateur Pilot's" letter in your issue of April 23rd, there must be many spheres of usefulness, both before and during an attempted invasion, in which amateur pilots, flying club machines, can be employed. Training H.G. machine gunners to keep their sights on a moving plane, with cross, oblique, and head-on sighting, would no doubt be of immense value to those who have had little or no practice in this respect. Taking local commanders round their positions by plane would probably result in a good many new ideas for camouflaging. Training H.G.s in concealment from aircraft, dropping messages, etc., during schemes, and several more uses which have not been thought of yet.

There must be scores of private and club aircraft stowed away somewhere which could be used. The hangar of my late lamented club was full in September, 1939. Why not form H.G. co-operation squadrons run by the R.A.F. until the H.G. were strong enough to run their own? The expense, from a petrol and maintenance point, would be far less than if R.A.F. types were used.

In battle they would be easy prey to a loose fighter or two, but there should be some combatant service, such as dumping a load of grenades on an enemy post, or ammunition on one of our own, or with a Lewis mounted, last war fashion, on gliders or marching troops, besides communications already referred to.

"1937 AM. PT."

Advantages During Invasion

I AM glad to see that the Home Guard Air Arm idea is finding its way into print at last. Although this scheme presents many difficulties to the official mind, i.e., aircraft maintenance, housing, training, etc., I consider that there is available sufficient talent to maintain light aircraft in a reasonably airworthy condition; the latest ultra-modern hangars are not required, and a dozen hours dual would be ample for the really interested candidate. The aircraft, under these conditions, might be forbidden to fly over industrial and built up areas, and so safeguard all.

The advantages in the event of invasion are obvious—local reconnaissance, communications, gas spraying, etc. (The Hun, we are told will use gas so why not be ready first for once?) If some of these planes were armed with light machine guns or grenades, they would have a tremendous harrying effect upon enemy troops deploying after glider and troop-carrier landings, and perchance, if, in some parts of the country glider landings were attempted, far from the main battle area in daylight, and a few lightly equipped sporting types were available, what would be more effective for dealing with the gliders? Gliders moving at 60 m.p.h. would be difficult targets

CORRESPONDENCE

for fighters, which would probably be fully occupied elsewhere.

Obviously there can be little chance of a small machine "getting away with it" for long under such conditions as troop harrying, but look at the hundreds of men prepared to take this risk, the hundreds who through some defect are unable to fly with the R.A.F. or have not had enough experience for the A.T.A.

And to the main point—there must be many sporting planes lying idle at the moment which would be still lying idle to-morrow if the Hun invades to-night. These surely could be utilised.

JAMES F. WHITTINGHAM,
(Home Guard, ex Flying Member, Civil Air Guard).

Support from a Flt. Sgt.

RE your correspondent "1926 A Licence," I should like you to have my opinion, for what it is worth. I consider the idea of an air arm to the Home Guard as an essential. It could be run on similar lines to the present "Army Co-op" squadrons, and I for one would like to help in the initial organisation (if any).

I am a Flight-Sergeant Pilot with over 2,000 hours to my credit and, at present, am waiting to be invalided out of the Service following injuries received in action against the enemy.

I would like to take this opportunity of thanking the Editor and staff for some very fine work during the last few years. *Flight* is definitely an asset to anyone air-minded.

P. J. McQ., Flt. Sgt.

Amateur Airmen's Enthusiasm

THE intriguing suggestion submitted by your correspondent for a H.G.A.C. has at last provided an indication of the sentiments of amateur airmen all over the country. For I do believe (without in the least deprecating the credit due to the originator) that there is a considerable number of enthusiasts who have thought on lines similar to those expressed by him, and are earthbound through varying circumstances of war and industry. Within this community, I would include many more, non-fliers it is true, but men of undoubted integrity and ability. Witness the response to the demand for A.T.C. instructors! It is obvious, therefore, that there is a universal feeling amongst these disciples of aviation that whilst putting the services at the disposal of the nation, they should be used to the best possible advantage.

This is a contention with which no one can disagree. Unfortunately, however, the obstacles to the "H.G.A.C." as visualised at present are very real, and would also imply the necessity for an unusual degree of confidence to be bestowed on such a body by the Air Ministry.

In spite of this, or again perhaps because of this, it becomes apparent that in comparison there would be little difficulty in recruiting a body of men employed in the aircraft industries who would welcome the opportunity of a "busman's holiday," and as in numerous cases they work or live in reasonable proximity to Service airfields, they could be found many interesting and useful duties to perform. They would require little or no instruction, working under the supervision of Service personnel, and would add considerably to their store of aeronautical knowledge and experience. In a well-organised civilian squadron it would be feasible to arrange duties on a rota basis so as not to interfere unduly with a man's domestic and other obligations.

Working in liaison with senior members of the A.T.C., such a movement could well become the nucleus of an organisation as hoped for by your correspondent, and in any case would be a worth-while war effort and definitely within the bounds of practical application. It would be well not to spoil our opportunities by "putting the cart before the horse."

G. A. CHAMBERLAIN.

The Bottleneck

YOUR correspondents on the above subject have, in my opinion, put forward a very strong case for the formation of such an air arm, and "1935 Amateur Pilot" surely raises an important point in his suggestion that the scheme must be got going *at once*.

Might I suggest that, if *Flight* is going to lend its weight to push this project, it might also help now by calling for volunteers, say one from each large town or district, to collect the names of probable members, so that, if and when the scheme is put into operation, no delay will be caused by waiting for volunteers. I have not the least doubt that *Flight* is read by fully 95 per cent. of "A" licence holders who are still in civil life, and if you were to collect and publish a list of names as indicated above, such people could get into touch directly with the one acting for their particular area. I for one would gladly act in such a capacity for my district, and if this suggestion is adopted I have no doubt that a useful list of "A" licence holders would soon be compiled, a list which should help to convince the "powers that be" that the scheme is well worth while.

There are probably a number of other people who, just before the war, did a certain amount of dual, but were prevented by the outbreak of hostilities from taking their licences, who would also be eager to support the scheme. I know of one such case myself, and these names could be listed along with the others, careful note being taken in all cases, of course, as to the actual experience of each individual.

"JUST PRE-WAR 'A' LICENCE."

[We have no doubt that if the suggestion for a Home Guard Air Arm is adopted, there will be a plentiful supply of willing "A" licence holders. The "bottleneck," if any, is not likely to be formed in that direction. The main obstacle will be suitable aircraft. We doubt that there are a dozen in private hands and still holding a certificate of airworthiness. Probably nearly every aircraft of the private-owner type which could be made airworthy is in use by the Services and for communications work. As a first step we should like to hear from owners of aircraft. If our fears should prove unfounded and a reasonable number of machines *are* available, one serious difficulty will have disappeared.—ED.]

POWER PLANTING

Fighter Pilot's View

WITH reference to the article, "Power Planting," which covered pages 249 to 255 in *Flight* dated March 19th, according to the last sentence it seems from someone's point of view that just because the pilot is not seated in front of the engines in the Lockheed Lightning, his fighting view would not be too good. This statement I do not agree with, as another example of this is the Bristol Beaufighter. The pilot of this machine is also not ahead of the engines, but I would definitely not say that his fighting view was poor.

I think this statement of mine proves itself, as one has only to look up the records of the Beaufighter's service in this war, and one will see immediately what a first-class machine it is. However, if the writer of "Power Planting" says that the Lightning has a poor view for the pilot, I am sure that he would also class the Beaufighter as having a poor one as well. If this were so, though, how is it that the Beaufighter has done such marvellous work at home and in the Middle East, as I am sure that this would have been impossible if the pilot had not had an excellent forward view. Perhaps someone could offer criticism on one or two of my points?

JOHN DARLINGTON.

CENTRALISED CONTROL

Unification of Land, Sea and Air Arms

YOUR Editorial and article on a general war staff are of great interest. Countries declaring war on one another recall their Diplomatic Representatives, who are responsible for the centralised control of intelligence reports of the Naval, Military and Air Attachés, which they hand on to their respective Foreign Offices, which in turn hand them to the Naval, Military and Air departments for the information of their respective staffs.

From these reports the Foreign Office of a country is in a position to act as adviser in Intelligence affairs to the General Staff which issues orders for action through the Operations Section of the General Staff, together with such information available through the Intelligence Section of the General Staff.

It will thus be seen that the success of a plan of action depends upon the reliability of the information available to the Intelligence Section of the General Staff which directly influences the strategy and orders given by the Operations Section of the General Staff.

The unification of the Land, Sea and Air Arms for the purpose of executing orders from the Operations Section of the General Staff is the duty of the inter-service liaison officers.

Centralisation is very simple and efficient provided the duties of one section are not duplicated by another.

REX DAINTY (Hon. Capt., R.A.F. (Ret.)).

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

Allies Decorated

SIR ARCHIBALD SINCLAIR, Secretary of State for Air, on behalf of the King, recently conferred the Order of Commander of the Bath on Rear-Admiral H. J. Riiser-Larsen, of the Norwegian Navy and Commander-in-Chief of the Norwegian Air Force. He also conferred the Order of Companion of the British Empire on Group Captain B. J. Kwiecinski, the Polish Air Attaché.

Sir Archibald Sinclair thanked Rear-Admiral Riiser-Larsen and Group Captain Kwiecinski for the services rendered by their respective countries to the Allied cause and for their personal services.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

DISTINGUISHED FLYING CROSS.

Flt. Lt. D. J. C. PINCKNEY, R.A.F.V.R., No. 67 Sqn. (since reported missing).—As a flight leader, this officer has displayed great skill and determination in his attacks on the enemy. In the Far East, Flt. Lt. Pinckney completed numerous sorties and destroyed several aircraft on the ground by machine-gun fire; he also destroyed two locomotives. He participated in the Battle of Britain, during which he destroyed at least four hostile aircraft.

Flt. Lt. D. E. HAWKINS, No. 240 Sqn., and P/O. J. G. WRIGHT, R.C.A.F., No. 240 Sqn.—As captain of aircraft and navigator respectively, Flt. Lt. Hawkins and P/O. Wright recently carried out an extremely important mission. The flight, which was of 24½ hours' duration, necessitated flying more than 2,000 miles across the sea. That complete success was achieved despite adverse weather and intense cold, can be attributed to the skilful piloting of Flt. Lt. Hawkins, combined with the brilliant navigation of P/O. Wright. Throughout, both these officers showed great powers of endurance and their outstanding performance is worthy of the highest praise.

Act. Flt. Lt. J. A. SWORD, R.A.F.V.R., No. 115 Sqn.—One night in April, 1942, this officer was captain of an aircraft which took part in an attack on the Matford factory at Poissy. In spite of heavy enemy opposition, he attacked from a low level and scored several hits with his bombs. Afterwards, Flt. Lt. Sword remained in the area until the attack had been completed by the main force and then made a further five runs over the target area and obtained some excellent photographs. This officer, who has carried out a considerable number of operational sorties, has invariably displayed courage and determination of a high order.

Act. Sqn. Ldr. F. W. THOMPSON, R.A.F.V.R., No. 10 Sqn.—This officer, as captain of aircraft, joined the squadron in April, 1941, and four months later assumed command of a flight. In the course of his many operational missions, Sqn. Ldr. Thompson has displayed outstanding persistence to achieve success. In his efforts to bomb and then photograph his targets he is dissatisfied with anything but the best results. Possessing great dash and powers of endurance, enemy opposition leaves him unmoved, and his tenacity of purpose remains unshaken in any circumstances. His technical knowledge has enabled him to become an expert adviser on flying problems and tactical decisions.

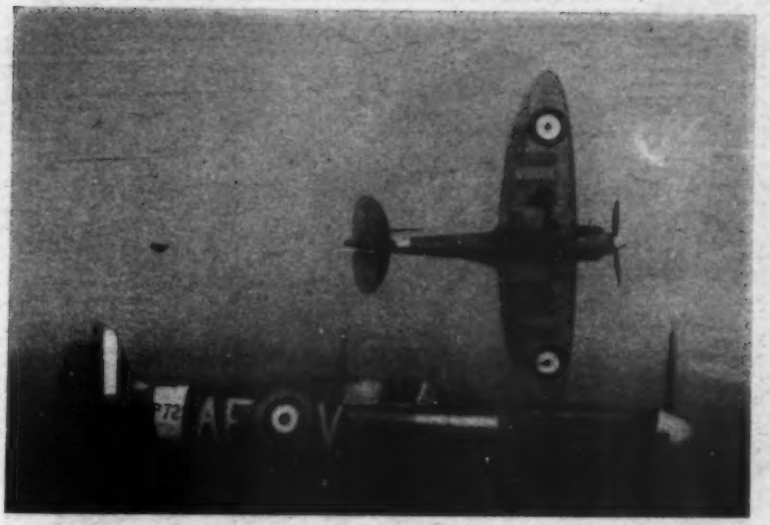
Act. Flt. Lt. L. S. DOWNES, R.A.F.V.R., No. 9 Sqn.—This officer is employed as gunnery leader. He has participated in sorties over enemy and occupied territory, including attacks on Le Havre, Bremen, Wilhelmshaven, Kiel and other important centres. He has invariably set a high standard of keenness and determination.

Act. Flt. Lt. H. H. LAWSON, R.A.F.V.R., No. 77 Sqn.—This officer has completed 28 sorties, involving attacks on highly defended areas in enemy and enemy occupied territory. Throughout, he displayed exceptional efficiency, and his main purpose has been to attack the enemy with the utmost determination. His excellent work as squadron navigation officer has done much towards raising the navigation of the unit to a high standard.

Act. Flt. Lt. S. G. WRIGHT, R.A.F.V.R., No. 76 Sqn.—Throughout his operational career this officer has proved himself to be an extremely reliable and trustworthy captain of aircraft. In all his sorties, except on one occasion when he was compelled to abandon his task owing to a very heavy electrical storm, he has successfully bombed his target. He has always displayed great leadership, skill and courage.

F/O. R. A. P. ALLSEBROOK, R.A.F.V.R., No. 49 Sqn.—This officer has proved himself to be a most reliable captain of aircraft. He has shown an excellent understanding of his responsibilities and he has always displayed courage, skill and determination. He has participated in attacks on a wide variety of targets, including Hamburg, Mannheim, Brest, Frankfurt and Wilhelmshaven. Many of his operational flights have been made in the worst of weather.

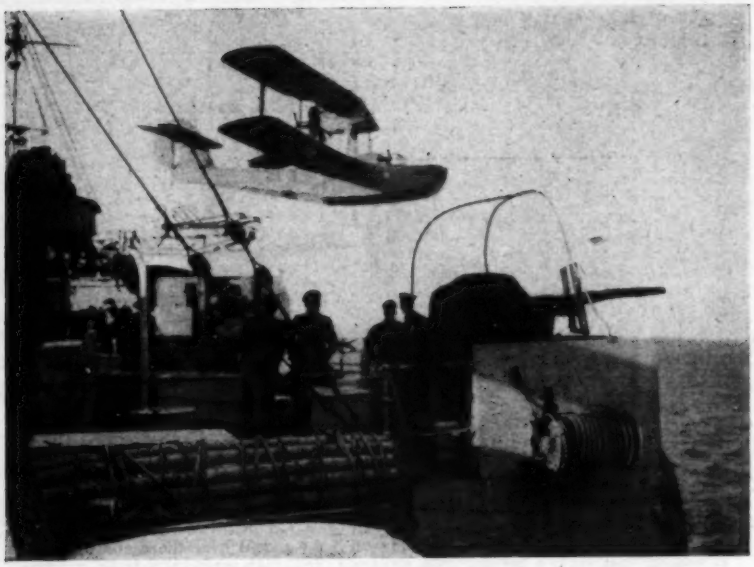
On the night of November 10th, 1941, he carried out a successful attack on the Blohm and



THE BREAKAWAY: Spitfires "peeling off" on arrival over the home base. It is seldom that such a perfect side elevation and plan view appear in a single photograph.

A number of awards were recently made to officers and men of the aircraft carrier H.M.S. *Argus* for courage and enterprise in air attacks against enemy submarines:

(Left to right) Lieut. (A) L. C. Plummer, D.S.C., R.N.V.R.; Lieut. B. E. Boulding, D.S.C., R.N.; Lieut. Commander G. A. L. Woods, D.S.O., R.N.; S/Lieut. (A) P. M. Wilkinson, D.S.C., R.N.; S/Lieut. (A) P. N. Phillips, D.S.C., R.N.V.R., and Petty Officer P. Reason, D.S.M., B.E.M. Three other members of the Squadron received D.F.M.s and nine were mentioned in despatches.



A Vickers Walrus amphibian being catapulted from H.M.S. *Shropshire*, which is a 10,000 ton, 8-inch gun, cruiser of the London class.

Voss shipyards at Hamburg. In February, 1942, following an attack on Mannheim, the port engine of his aircraft seized. Jettisoning all loose equipment, F/O. Allsebrook flew the aircraft for more than four hours with the starboard engine only. His entire fuel supply finally became exhausted and he was compelled to descend on the sea, but the crew were rescued by a naval craft after spending some fourteen hours in the dinghy. F/O. Allsebrook showed great skill and overcame many difficulties during the long flight over enemy territory.

F/O. J. ANNADALE, R.A.F.V.R., No. 110 Sqn.—This navigator has performed excellent and courageous work over a long period. He has completed 40 sorties, including attacks on the enemy's dockyard installations, airdromes and industrial targets. His navigation and accurate bomb-aiming have contributed materially to the successes obtained. F/O. Annandale is now carrying out a second tour of operational flying. He has at all times shown initiative and great determination.

F/O. J. A. G SKINNER, R.A.F.V.R., No. 9 Sqn.—As wireless operator-air gunner, this officer has been engaged on operational flying since September, 1940. He has participated in attacks on a variety of enemy targets. On one occasion in September, 1941, he was the wireless operator of a Wellington aircraft detailed to attack Genoa. Whilst flying over the French coast, his aircraft was attacked by enemy fighters and the intercommunication was rendered unserviceable.

Sqn. Ldr. J. A. F. Maclachlan, D.F.C. and Bar, the one-armed leader of a Hurricane squadron.

F/O. Skinner established W/T communication with base, and, by passing message slips to his captain, greatly assisted in the safe return of the aircraft. On a previous occasion during a sortie against Bremen his wireless was damaged and rendered unserviceable as the result of an electrical storm. Despite trying circumstances, F/O. Skinner succeeded in repairing the set and in obtaining fixes which enabled his pilot to fly the aircraft safely to base.

Act. F/O. W. G. BARNES, R.A.F.V.R., No. 149 Sqn.—This officer has participated in attacks on enemy dockyards, shipping and industrial targets, and he has always shown the greatest determination to complete his tasks.

Act. F/O. J. L. MARTIN, R.A.F.V.R., No. 7 Sqn.—As navigator, this officer has participated in numerous sorties over enemy and enemy-occupied territory, including attacks on Kiel, Hamburg, Cologne, Turin and other important targets. By his ability and his tireless efforts, F/O. Martin was selected to become station navigation officer. He has always shown courage and a strong sense of duty.

P/O. L. J. ACKLAND, R.A.F.V.R., No. 156 Sqn.—This officer has participated in 31 sorties against important targets in enemy and enemy-occupied territory. He has always displayed the greatest determination to reach and bomb his objective whatever the conditions. His courage and complete disregard of his own safety have been outstanding.

P/O. R. W. BRAY, R.A.F.V.R., No. 75 (N.Z.) Sqn.—This officer has completed a large number of sorties, involving attacks on most of the important enemy dockyard and industrial towns in Germany as well as attacks on Brest, Le Havre and Boulogne. He has also carried out an attack on Genoa. Although all his operational missions have been made against highly defended targets, P/O. Bray has always carried out his task with keenness and determination. He is an extremely efficient captain of aircraft who, by his personal example, has instilled a fine spirit of enthusiasm and co-operation in his crew. Throughout P/O. Bray has shown unflinching devotion to duty.

Flt. Lt. B. F. ROSE, R.A.A.F., No. 248 Sqn.—This officer has proved himself to be a brave and skilful pilot. Following a flying accident, which necessitated the amputation of his left leg below the knee, he resumed operational flying after being fitted with an artificial limb. Since October, 1941, he has taken part in sorties wherein a wide variety of targets have been attacked.

During the operations on Vaagso he shot down a Heinkel 111 which attempted to attack our shipping. One day in April, 1942, he skilfully drove off a Junkers 88 which was attacking a ship, and the next day he destroyed a Heinkel 115. This officer's leadership, skill and outstanding devotion to duty have proved an inspiration.

Act. Flt. Lt. R. M. LLOYD, R.A.F.V.R., No. 185 Sqn.—This officer is a confident and skilful fighter pilot. He has destroyed two, probably destroyed three and damaged a further five hostile aircraft. He invariably presses home his attacks from the closest range.

Act. Flt. Lt. N. C. MACQUEEN, R.A.F.V.R., No. 249 Sqn.—This officer carried out a large number of sorties over enemy occupied territory and destroyed one enemy aircraft whilst based in this country. In the Middle East he has destroyed a further four hostile aircraft. Throughout his operational career, Flt. Lt. MacQueen has rendered most valuable service. He has displayed great skill and leadership.

SERVICE

P/O. O. O. ORMROD, R.A.F.V.R., No. 185 Sqn.—This officer is a most determined pilot. Whatever the odds, he endeavours to press home his attacks to the utmost. He has destroyed two, probably destroyed three and damaged a large number of enemy aircraft. His courageous leadership has set an admirable example.

P/O. J. A. PLAGIS, R.A.F.V.R., No. 249 Sqn.—Since the beginning of March, 1942, this officer has destroyed four and probably destroyed a further three hostile aircraft. With complete indifference to odds against him, he presses home his attacks with skill and courage. In one day alone he destroyed two enemy fighters and one bomber. He has set an outstanding example.

P/O. D. J. SCOTT, R.N.Z.A.F., No. 3 Sqn.—During a long period of operational flying, this officer has carried out a large number of sorties, including attacks on shipping, airfields, night flying operations and close bomber escorts. Throughout, he has displayed great skill and keenness, while his exceptional devotion to duty has set an admirable example.

P/O. P. WIGLEY, R.A.F.V.R., No. 185 Sqn.—This officer has displayed inspiring leadership and courage. He has destroyed two and probably destroyed a further three enemy aircraft. He has displayed exceptional keenness to engage the enemy, and, when not engaged in operations in the air, he mans a gun on the airfield.

DISTINGUISHED FLYING MEDAL.

Flt. Sgt. C. T. T. BRADY, No. 156 Sqn.—One night in April, 1942, this airman was the wireless operator of an aircraft which attacked Cologne. During the attack, the second pilot was severely wounded in the stomach by a piece of shrapnel. In harassing circumstances, Flt. Sgt. Brady immediately applied first-aid to his wounded comrade. Throughout the return journey, this airman's exceptional wireless skill was of the greatest assistance to his captain and contributed materially to the safe return of his aircraft. Flt. Sgt. Brady displayed great courage and devotion to duty.

Flt. Sgt. V. D POPE, R.A.F.V.R., No. 502 Sqn.—In April, 1942, this airman was the captain of an aircraft engaged on a patrol over the Atlantic. An enemy submarine was observed on the surface. Flt. Sgt Pope immediately attacked it from a low level and it is believed he obtained at least one hit. The speed and accuracy with which the attack was delivered reflects the greatest credit on the efforts of this airman.

Flt. Sgt A. J. F. RAYMENT, R.A.A.F., No. 43 Sqn.—This airman was the second pilot of an aircraft which recently attacked Essen. Nearing the target area the aircraft came under heavy fire and the captain was wounded in his right thigh, causing him to lose control of the aircraft.

Flt. Sgt. Rayment managed to extricate his wounded captain from the pilot's seat and, taking his place, succeeded in regaining control of the aircraft, which had gone into a spiral dive. He finally flew the aircraft safely back to this country. By his skill and promptitude, this airman undoubtedly saved his aircraft from destruction.

Sgt. J. DAVIES, No. 7 Sqn.—One night in April, 1942, this airman was the captain of an aircraft which attacked Cologne. Flying over the target area, his aircraft was held in a cone of numerous searchlights and subjected to heavy and concentrated anti-aircraft fire. Undeterred, he flew in to the attack and, although one of the propellers was dislodged by the enemy's fire, he dived to 800 feet and bombed his objective. On the return journey his aircraft was twice inter-

IN LUCK'S WAY: A sergeant pilot who was fortunate enough to torpedo an enemy supply ship on his first operational trip.

AVIATION

cepted by enemy fighters, but, cleverly evading them, he succeeded in flying his damaged aircraft safely to base. Throughout, this airman displayed great courage and skill.

Sgt. H. C. DUFFIELD, R.C.A.F., No 83 Sqn.—On March 28, 1942, this airman was the rear gunner of an aircraft which participated in an attack on Lubeck. During the operation his aircraft was attacked by an enemy fighter, whose fire rendered the rear turret unserviceable and wounded Sgt. Duffield in the head, stomach and in both his knees. Undismayed, he crawled from the turret and dragged himself to the mid-upper turret, where he manned his guns in readiness to meet any further attack; the gunner in this turret had been wounded in the arm.

The fighter had broken away, however, and did not return, and Sgt. Duffield was then extricated from the turret, being unable to walk. Throughout the return journey he displayed great fortitude and cheerfulness in spite of his wounds, and his great devotion to duty was a fine example.

Sgt. R. ROBERTS, No. 150 Sqn.—One night in March, 1942, this airman was the rear gunner of a bomber which was intercepted by an enemy fighter near Emden. By his accurate shooting he coolly warded off the attacking aircraft and, it is believed, destroyed it. A few nights later, whilst over Belgium, he engaged a Messerschmitt 110. Although his own aircraft was damaged in the combat, Sgt. Roberts used his guns most effectively and probably destroyed the enemy aircraft. This airman has participated in numerous operational missions, and he has at all times shown fine qualities and set a most praiseworthy example.

Sgt. F. DAVIDSON, No. 9 Sqn., and Sgt. H. J. PULLEN, No. 9. Sqn.

As captain of aircraft and navigator respectively, Sgts. Davidson and Pullen participated in an attack on Lubeck on March 28, 1942. Shortly after crossing the enemy's coast, their aircraft was attacked by an enemy fighter and sustained considerable damage. The rear turret was put out of action, the hydraulic system rendered unserviceable, causing the bomb doors to open, the flaps to drop and the undercarriages to emerge partly from their nacelles.

Sgt. Pullen was badly wounded in the thigh, while the rear gunner and second pilot also received injuries. In extremely harassing circumstances, Sgt. Davidson coolly and skilfully evaded his attacker and set course for this country. Sgt. Pullen, although suffering severely, insisted on fulfilling his duties and skilfully navigated the aircraft to the English coast before being persuaded to rest. Flying on to base, Sgt. Davidson finally made a successful landing with the undercarriage retracted. Throughout, these airmen displayed great courage and determination in the face of extreme difficulties.

Flt. Sgt. R. ARMSTRONG, R.A.F.V.R., No. 420 (R.C.A.F.) Sqn.—As an observer this airman has taken part in attacks on Brest, Lorient, St. Nazaire, Kiel, Hamburg, Cologne, Berlin and Oslo. Several of these were carried out under difficult conditions and Flt. Sgt. Armstrong always displayed great keenness and skill.

Flt. Sgt. W. R. ARMSTRONG, No. 76 Sqn.—This airman has been engaged on operational flying since war began. He has participated in a large number of sorties, including five attacks on Berlin. Both in the air and on the ground his work as wireless operator-air gunner has been of the highest standard.

AT THE MIGHTY WURLITZER: Training naval gunners to handle multiple two-pounder pom-poms.

Flt. Sgt. G. E. HORRICKS, No. 185 Sqn.—Flt. Sgt. Horricks is a fearless pilot. He invariably presses home his attacks with the utmost determination regardless of the odds. He has destroyed at least three enemy aircraft and probably destroyed a further two.

Sgt. J. L. BOYD, No. 185 Sqn.—Sgt. Boyd is a courageous and skilful leader. He has shown the greatest keenness to attack the enemy at all times regardless of the odds against him. Sgt. Boyd has destroyed three and probably destroyed a further four enemy aircraft.

THE KING has been graciously pleased to approve the following awards to the undermentioned officer and airman of the Royal Australian Air Force:—

GEORGE MEDAL.

F/O. N. W. WEBSTER.

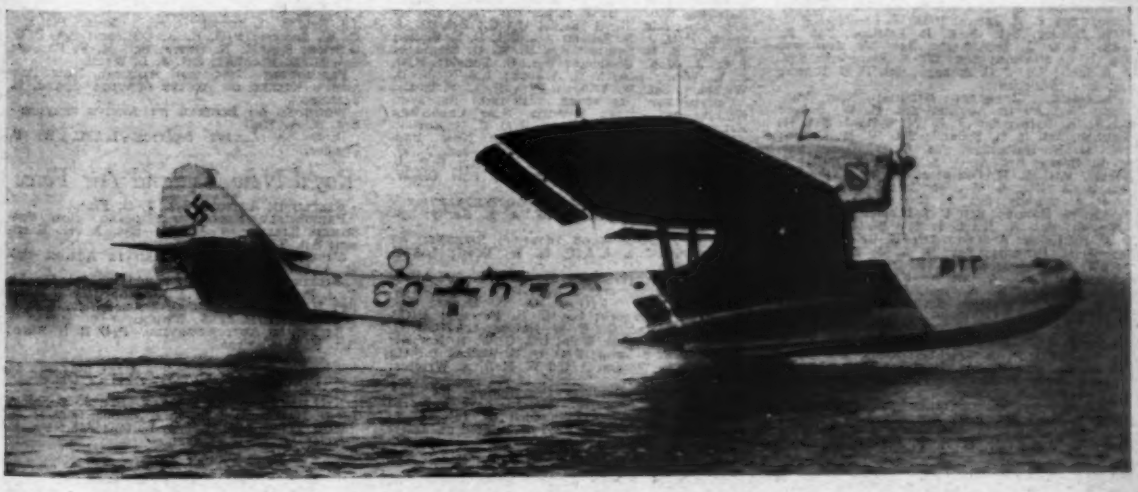
Sgt. L. M. VAN PRAAG.

On January 26th, 1942, the aircraft in which this officer and airman were first and second pilot respectively was attacked by two Japanese fighters and compelled to make a forced landing on the open sea. The aircraft sank after a short time and the crew of four took to the water wearing their life jackets. F/O. Webster surrendered his jacket so that another member of the crew, who was a heavy man and a non-swimmer, might be adequately supported. The fourth member of the crew was semi-conscious owing to the shock of the forced landing.

F/O. Webster and Sgt. Van Praag supported him and towed the non-swimmer to the shore. They were in the water for 30 hours, during which time they beat off several shark attacks. In saving the lives of their companions in circumstances fraught with grave danger to themselves, they both exhibited courage of the highest order.

THE KING has been graciously pleased to approve the award of the British Empire Medal (Military Division) to:—

Flt. Sgt. G. D. GAMBLE, R.A.F.V.R.—In January, 1942, while flying over Northern Ireland, this captain of an aircraft engaged in a non-operational flight was forced to attempt a landing owing to the weather. With great skill he succeeded in making a landing in the face of a heavy snowstorm. On impact, Flt. Sgt. Gamble was stunned but, recovering quickly, he managed to scramble through the starboard window on to the starboard wing, which was on fire. After rolling himself in the snow to extinguish the flames from his burning clothing, Flt. Sgt. Gamble observed the second



A German Dornier Do 18 reconnaissance flying boat which was developed from the type used before the war by Deutsche Lufthahsa on the South Atlantic service. The engines are two 600 h.p. Junkers Jumos.

SERVICE AVIATION

pilot jammed in the starboard window and, dashing through the flames, he pulled him clear. He then collected the crew but, on finding one member missing, he re-entered the burning aircraft and attempted to reach the wireless cabin. He was driven back by the flames, however, but called out several times before being forced to retire. He then found that the missing airman had escaped through the broken fuselage. Thereafter, Flt. Sgt. Gamble took charge of the party, all of whom were suffering from burns and abrasions and two from broken ankles. Throughout, this airman displayed great courage and a complete disregard of his own safety.

Flt. Sgt. D. E. C. LOCKYER.—One night in January, 1942, an aircraft, whilst returning from an operational patrol, crashed in the Shetlands and caught fire. Flt. Sgt. Lockyer, a member of the crew, sustained injury to an ankle. In spite of exploding ammunition and the knowledge that a depth charge was in the aircraft, this airman succeeded in extricating an officer from the blazing wreckage and rolling him to a place of safety. Flt. Sgt. Lockyer then returned to the aircraft but was unable to rescue other members of the crew owing to the flames. Subsequently, without boots and in complete darkness, gale and rain, he tramped four miles over boggy country to get assistance. Flt. Sgt. Lockyer displayed great fortitude and determination with a complete disregard of his personal safety.

THE KING has been graciously pleased to approve the following award in recognition of brave conduct:—

MILITARY MEDAL.

Sgt. J. S. DEWHURST.—Sgt. Dewhurst has on many occasions displayed great bravery and indifference to danger during enemy bombing raids. While in charge of the fire fighting party, he has been responsible for saving many aircraft from destruction during continuous bombing. On one occasion in March, 1942, he saved the crew of a burning aircraft. Some days lafer, he extinguished the flames of burning aircraft in circumstances of considerable danger. Sgt. Dewhurst has always displayed outstanding devotion to duty.

Roll of Honour

Casualty Communiqué No. 129.

THE Air Ministry regret to announce the following casualties on various dates. The next-of-kin have been informed. Casualties reported "in action" are due to flying operations against the enemy; "on active service" include ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

KILLED IN ACTION.—Act. Flt. Lt. F. C. Barrett, D.F.C.; Sgt. N. A. Branchflower; Sgt. W. P. Brooks; Cpl. A. McM. S. Brownlie; Sgt. G. Buchanan; Sgt. L. P. J. Caldwell; Sgt. J. E. Church; P/O. D. A. E. Clarke; Sgt. K. C. E. Corke; Act. Flt. Lt. G. G. Duff, D.F.C.; Sgt. H. J. Evans; Sgt. L. R. Foulkes; Sgt. H. J. Gibbons; Sgt. C. J. Ingram; Sgt. A. J. Leaver; Sgt. R. Lemmon; Sgt. P. H. Morey; Sgt. S. J. Rout; Flt. Sgt. A. D. Saunders; Sgt. N. S. Smith; P/O. J. P. Tolson; Act. Wing Cdr. R. J. Wells, D.F.C. and bar; Sgt. A. J. Woolsey.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. H. E. Chamberlain; Sgt. E. S. Furley; Sgt. E. R. James; P/O. W. Laidlaw; P/O. P. L. Lander; Sgt. G. E. R. Latimer; Sgt. H. Leake; P/O. J. McAnnally; Sgt. W. Meadows; Sgt. J. E. Pearson; Sgt. W. A. Saunders; Sgt. T. J. Snell; Sgt. J. C. Spragge; Sgt. P. B. Tomes; Sgt. E. J. Waldron.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. G. W. Baker; Sgt. R. E. Baird; Sgt. J. E. W. Ballard; Sgt. H. Bonnett; Sgt. R. G. Boswell; Sgt. W. M. Brown; P/O G. N. Busbridge; Sgt. S. W. Dane; Sgt. W. R. Davey; Sgt. A. C. A. Davis; P/O. M. M. Evans; P/O. B. M. Fournier; Sgt. F. D. Fowler; Sgt. R. A. Gladen; Sgt. R. J. Greenough; Sgt. A. P. J. Grundy; Sgt. E. Haste; Sgt. L. Hill; Sgt. N. W. Hoskins; Sgt. P. I. Leeman; Sgt. J. H. Matetich; Sgt. A. Mitchell; Sgt. S. Morris; Sgt. F. P. Nekludow; Act. Sqn. Ldr. N. Orton, D.F.C.; Sgt. J. C. Pengelly; Sgt. B. A. J. Richardson; Sgt. J. J. Robson; Sgt. K. E. Runcorn; Sgt. V. Scholey; Sgt. G. A. Smith; F/O. J. F. Swift, D.F.C.; Flt. Lt. K. W. Tait, D.F.C.; Sgt. J. C. Ward; Sgt. D. Watson; Sgt. W. Watson; F/O. T. H. Worth.

WOUNDED OR INJURED IN ACTION.—Sgt. C. R. Amos; F/O J. R. Anderson, D.F.C.; Sgt. S. F. Hayden; P/O. P. D. Weight-Vowden.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. J. A. Crosbie; P/O. M. S. Davidson; P/O. W. B. Stephens.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. A. G. Harvey; Sgt. P. G. Sanders.

MISSING.—Sgt. R. A. Bell; Flt. Sgt. J. A. Chamberlain; Wing Cdr. E. H. P. Clarke; Sgt. J. W. Dale; Sgt. D. W. Dewar; P/O. W. Duncan; Sgt. L. J. Dunn; Sgt. B. J. Dykes; Sgt. D. G. A. Evans; P/O. H. M. Fox; P/O. O. Gandy; Sgt. J. H. Godfrey; Sgt. E. P. Hanrahan; Sgt. H. J. Hickman; F/O. A. H. Hiles; P/O. B. L. F. A. Holland; Sgt. E. M. Jennings; P/O. I. A. B. Johnstone; Sgt. R. McGibbon; Sgt. A. J. Marshall; P/O. M. O. Ogier; P/O. D. F. W. Parish; Sgt. J. M. Parker; Sgt. J. H. F. Parnham; A/C.2 R. A. Presdee; Flt. Sgt. J. V. Routledge; P/O. R. P. Runagall; P/O. J. Spalding; Sgt. S. W. Stevenson; Sgt. G. H. Tilley; Flt. Sgt. R. D. C. Tomlinson; Sgt. D. Walker; Sgt. N. H. Webster; Sgt. T. W. Weeks; Sgt. W. Wright.

KILLED ON ACTIVE SERVICE.—Act. Flt. Lt. C. H. Baker, Sgt. D. S. S. Balfour; P/O. P. L. Bantock; Sgt. V. Baxter; P/O. J. C. M. Booth; L.A/C. S. Broome; Flt. Sgt. F. W. Burns; Sgt. P. H. Burston; Act. Flt. Lt. J. D. W. H. Clutterbuck, D.F.M.; Sgt. T. E. Coogan; Act. F/O. D. McL. Craik; Sgt. L. D. J. Crozier; Act. Sgt. W. B. Davies; Sgt. D. O. L. Dold; F/O. G. E. Fletcher; Flt. Sgt. S. A. Gardner; Sgt. J. F. Green; P/O. W. C. H. Hallet; Act. Sgt. G. A. Hanson; Sgt. J. Hayhurst; Sgt. A. Holmes; Sgt. L. F. Humphrey; W/O. F. E. Johnson; Sgt. K. B. Jones; Sgt. E. W. Jordan; Sgt. J. C. Joss; Act. Sgt. A. Leighton; Sgt. R. Leyland; Flt. Lt. K. Linton; P/O. D. E. Lloyd; Sgt. R. H. Marsh; F/O. H. M. McGuffie; Act. F/O. D. A. Olver; Sgt. R. J. Randall; Sgt. L. Ratcliffe; Sgt. R. J. J. Robo. Sgt. H. Rogerson; Act. Sqn. Ldr. N. S. Royle, D.F.C.; Sgt. R. J. Scarff; P/O. J. N. Sellers; Act. Sgt. D. E. Smith; Flt. Sgt. S. R. Squires; Sgt. R. W. G. Stephens; P/O. J. McN. Strachan; Sgt. C. Tofield; F/O. J. I. Ward; L.A/C. R. Waugh; L.A/C R. D. Wickham; Sgt. W. Wilson; P/O. H. L. Wright.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. R. H. Burton.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. J. W. Hamborough; Flt. Sgt. R. R. Jowett; Sgt. A. Mewbould; Sgt. H. G. Simpson; Sgt. C. W. Strutt.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 F. A. Hall; A/C.2 W. A. F. Kerby; Sgt. T. J. Roberts.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. G. W. Bond; L.A/C. M. Glassman.

DIED ON ACTIVE SERVICE.—L.A/C. T. Allen; A/C.1 R. Armstrong; L.A/C. J. J. Ayres; Cpl. C. A. Crapper; F/O. P. C. T. Dewar; Sgt. W. H. A. Drewcock; L.A/C. H. Fearney; A/C.1 S. A. Gamble; A/C.2 T. W. Hollies; L.A/C. J. G. Logan; A/C.2 A. H. Mole; L.A/C. W. D. Nesbitt; A/C.2 G. F. Siddron; F/O. G. E. Walker, D.F.C.; A/C.2 E. G. Waters; A/C.2 W. McB. A. Webster; A/C.1 J. Winter.

Amendment to Casualty Communiqué No. 124.

Sgt. J. A. Lancaster.—Should have appeared under the heading "Wounded or Injured in Action," and not "Wounded or Injured on Active Service."

Off-time at a Royal Air Force Initial Training Wing. The bag of golf clubs under the nearest bed is a sign of the times.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. C. A. Cornwell; Sgt. L. R. Williams.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. R. L. O. Ryder.

MISSING.—P/O. R. K. Durbridge; Sgt. R. N. Lonergan; P/O. M. J. Martel; Sgt. L. J. Martin; Sgt. M. A. McDonald; Sgt. G. L. Skinner.

KILLED ON ACTIVE SERVICE.—Sgt. R. J. Mairre.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. W. A. Godfrey.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. C. S. Goodenough; Flt. Sgt. G. F. King; Flt. Sgt. J. L. Moore; P/O. T. T. B. Stoker.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. E. A. Tredenick.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. J. F. Codville; P/O. P. D. G. Stuart.

MISSING.—Sgt. J. M. Broddy; Sgt. E. C. Evans; Sgt. F. C. Garnett; P/O. J. R. Gorham; P/O. R. L. G. Hosea; P/O. J. M. Runner; Act. F/O. J. F. K. Sandys.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. N. Ccleman; Sgt. T. D. Dakin; Sgt. H. W. Garvin; Flt. Sgt. C. H. Jay; P/O. W. I. Jones; Flt. Sgt. R. W. Lemere; P/O. H. A. O'Blenes; Sgt. P. G. O'Brien; Sgt. R. R. Oliver; Sgt. M. F. Ramsey; Sgt. M. D. Rochfort; Sgt. J. L. Wyatt.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. J. E. JAMIESON.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. J. A. Hull.

DIED ON ACTIVE SERVICE.—L.A/C. W. F. Cramer.

Royal New Zealand Air Force

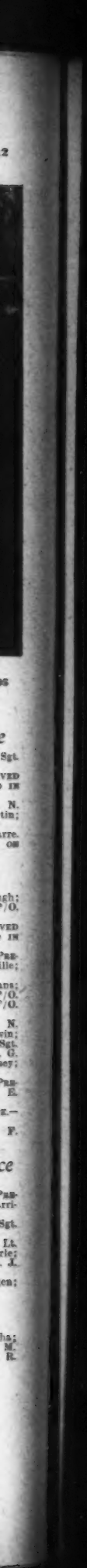
KILLED IN ACTION.—Sgt. J. G. Finn.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. A. H. Harrison; Sgt. T. Y. Wyllie.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. R. A. Scragg.

MISSING.—Sgt. C. E. J. Aitchison; Act. Flt. Lt. T. J. D. Baber; Sgt. J. L. Brown; P/O. J. Earle; Sgt. H. J. Price; Sgt. C. R. Spence; Sgt. R. D. J. Woodcock; P/O. L. A. Wright.

KILLED ON ACTIVE SERVICE.—P/O. R. N. Allen; Sgt. E. H. Hawken.

South African Air Force

KILLED ON ACTIVE SERVICE.—Sgt. J. J. Botha; Lt. G. Hackland; 2/Lt. K. I. Jacobs; Capt. H. M. Leith; 2/Lt. F. H. Lumley-Linton; Air Mech. R. Searle; Lt. M. H. Tathan.